$4.00 a Year Published Monthly 50c a Copy

VETERINARY MEDICINE

AUGUST 1942

JUL 16 1942

Forestall

CONTENTS

Cavalry in War 311-323

Horses in Great Britain, 311; Recovered Animals of Value to the Army, 311; The Ideal Pack Horse, 311; A Prediction Verified by Events, 311; Arabian Club Donates Horses to U. S. Army, 311; The Home Guard (England) Replaces Motors with Horses, 311; Maintain Wartime Communications, 312; Many Horse Patrols Organized, 312; The Horse in Modern Warfare, 313; Cavalry in Second Army Maneuvers, 313; Cavalry Achievements in the Present War, 314; Army Mounts Carefully Selected, 315; General Pershing's Mounts, 315; Horse Power Needed, 315; Transportation in East Africa, 315; Front Royal Remount Depot, 316; China Establishes Stations for Breeding Army Horses, 316; Horse Breeding Among the Crow Indians, 317; Transportation of Animals Overseas, 318-320; A.V.M.A. Scheduled to Meet in Chicago, 321; The Art, Science and Profession of Veterinary Medicine, 321; Mortar Squad, Fort Riley, Kansas, 322; Use of Cavalry in the War, 322; Russian Veterinary Service, 322; The Horse on Wheels, 323.

When the Red Cavalry Charges the Toll of Animals Is Indescribable—Eric Hardy 324

Experiences in an Army Veterinary General Hospital—D. M. Campbell 326

The Relationship of St. Louis Encephalitis Virus to the Equine Encephalitis Problem—M. S. Shahan, L. O. Mott, R. L. Knudson, O. L. O. Steen and L. T. Giltner 339

Treatment of Lice in Army Horses—Lieut. A. N. Bain 346

Abstracts 347-350

African Horse Sickness, 347; Blood Groups and Blood Transfusion in Army Horses, 347; Artificial Feeding of Army Horses, 347; Seaweed Fed to Army Horses, 348; A Blasted Horse, 348; Vitamin A Deficiency in Finnish Army Horses, 348; Rare Case of Foreign Body in a Horse, 349; Mustard Gas and Army Animals, 349; Hematidrosis in Russian Horses, 350; Phenothiazine in the Treatment of Strongylosis, 350; Sulfanilamide in the Treatment of Strangles, 350; Italian Veterinary Service, 350.

VOL. XXXVII
No. 8

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879.

7632 S. Crandon Ave.
Chicago, U.S.A.

★ ★ ★ ★ ★ ★ ★ ★ ★ *Treat*

STREPTOCOCCIC MASTITIS* *with*

TY-SIN

* Streptococcus Agalactiae Infection

★ ★ ★ ★ ★ ★

Jen Sal

Jen-Sal TY-SIN, the first gramicidin-type product made available commercially for combatting streptococcic mastitis, is backed by a wealth of controlled investigational work conducted by our laboratories as well as independent research institutions and practicing veterinarians.

Studies conducted by our laboratories under general practice conditions indicate that one 40-c.c. dose is approximately 63.2 per cent effective and two 40-c.c. doses administered at interval of 7-10 days is 79.3 per cent effective in eliminating *Streptococcus agalactiae infection.*

TY-SIN is an aqueous-alcoholic suspension containing in each 20 c.c., 40 mg. of TYROTHRICIN.

TY-SIN may be used on lactating or dry cows — exerts only temporary, minimal influence on milk production.

250 c.c. $3.25

WRITE FOR LITERATURE

JENSEN-SALSBERY LABORATORIES, INC.

KANSAS CITY, MISSOURI

VETERINARY MEDICINE

Registered in U. S. Patent Office

VOL. XXXVII AUGUST, 1942 No. 8

Published Monthly by the

VETERINARY MAGAZINE CORPORATION

7632 S. CRANDON AVE., CHICAGO, ILL., U. S. A.

$4.00 a year; per copy 50 cents; Special Issues $1.00

All matter appearing in this publication is copyrighted. No part of it may be reproduced without specific permission. Permission will be given if the purpose is unobjectionable. If there be any question as to the propriety of reproduction the author will be consulted.

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879. Entered as second-class matter under the title of American Journal of Veterinary Medicine July 19, 1910, at Chicago, Ill., under the Act of March 3, 1879.

D. M. CAMPBELL, *Editor*
7632 S. Crandon Ave., Chicago, Ill.
Telephone South Shore 7160

H. J. MOSTYN, *Eastern Representative*
1265 Broadway, New York, N. Y.
Telephone Murray Hill 4-4037

COPYRIGHTED, 1942, BY VETERINARY MAGAZINE CORPORATION

In 1940 there were 1,000,000 horses in Britain. 40,000 in Greater London alone.

* * * *

On the economical side, the operation of a veterinary service is based upon the presumption that it is cheaper to cure a sick animal "taken in time" than to procure a new one of uncertain fitness. Recovered animals, inured to exposure, to inclement weather, hard work, irregular rations and infection are worth more to the army in the field than several times their number fresh from the purchasing boards—and they cost far less.—*Vet. Mil. History.*

* * * *

The ideal military riding or pack horse has the following characteristics: a deep body with well sprung ribs covered with a heavy muscle coat, sloping shoulder, well defined withers extending well into the back, a long neck, light throatlatch, and last, but most important, straight legs, properly placed, that move absolutely true (clear the opposing member without an inward or outward swing and with no excessive elevation in flight). He must work in company at the gallop without excitement, be able to carry 250 pounds 30 miles a day six days a week, or in case of emergency, 100 miles in 24 hours and never turn away from his feed, regardless of how poor it is in quality.—*National Horseman.*

In World War I in the campaign in France, the A.E.F. used 243,360 and the B.E.F. 750,000 animals.

* * * *

Germany used 200,000 horses in the Polish blitzkrieg and nearly four times this number in the campaign in the low countries and France. Many more horses are being used by the German army during this war than at any time during World War I. In large measure, these have been requisitioned from conquered countries. All stallions suitable for siring army remounts have been systematically collected in invaded countries and sent to Germany.

* * * *

THE A.V.M.A. CONFERENCE MAY NOT BE HELD

The meeting of the A.V.M.A. scheduled to convene in Chicago, August 17, may not take place as the Stevens Hotel has been taken over by the Army Air Corps.

The Board of Governors of the A.V.M.A. were to meet in Chicago, July 13, (after these pages had gone to press) to decide whether to call the meeting off (an expedient which VETERINARY MEDICINE all along has believed would be propitious on account of war conditions and troop movements) or to make arrangements with another hotel. In that event a three-day session is contemplated instead of the four days originally planned and it is unlikely that there will be exhibits.

Maintain Wartime Communications

To accomplish this there is needed an organization of patrols the members of which in emergency can be instantly available at definite, predetermined spots when usual methods of communications fail.

The most adaptable horse, and also the one most perfectly suited to maintain communications, to patrol highways, to get across country where roads have been blocked and automobile traffic stalled, to carry messages through darkened streets, to bring aid quickly to stricken areas after main coastal roads have been bombed or shelled, is the hunter who has been going across country every hunting day. Foxhunters are located near every large city up and down the eastern seaboard from New England to Carolina and around vital manufacturing districts in the middle west. These cities are the danger points and foxhunters are an excellent nucleus around which to form horse troops for emergency work. In addition these horses can be broken to harness and put to wagons to provide transportation as the tire shortage grows more acute.—*The Chronicle.*

Many Horse Patrols Organized

Organizations of horse patrols have been formed throughout the New England and Eastern Seaboard states. They are cooperating with the Office of Civilian Defense in Washington. It is possible (highly probable) that the Atlantic seaboard may be bombed and through destruction of property, cause a failure of communications and a need for the mounted messenger.

Most of the New England roads are narrow and crooked, and criss-crossed at all angles and all frequencies. So a tremendous amount of policing to keep refugees on roads assigned to them and off roads assigned to the militia will be necessary.

To be competent for effective work in emergency, a volunteer must be well mounted and well trained for either courier or police work. For the latter he must be familiar with cross-country routes and experienced in cross-country riding. Hunt club members are already so experienced.

Most privately owned horses have never been out after dark, and comparatively few horsemen do much night riding. Volunteers and their horses are being trained for both day and night work. Patrol members should be limited to potentially competent, earnest volunteers (an untrained volunteer or unschooled horse could be a total liability instead of a defense asset). The reward is possible usefulness in a desperate emergency.

For courier service, cross-country routes are defined and relay stations established.

Longer alternate routes are being mapped to supplement shorter routes through lands that become bogs in wet weather; and the volunteers assigned to these routes ride them day and night until they are thoroughly familiar with them. For in emergency, the volunteer must ride them regardless of all nerve-racking conditions if he is to serve any effective purpose in such a possible war-created emergency.

Photo by U. S. Army Signal Corps

TROOP OF CAVALRY IN NORTHERN WISCONSIN AT THE "LEAD"

This photograph was taken during Second Army maneuvers. The fatigue uniforms and the extra hatbands indicate that they belong to the "Enemy"

The Horse in Modern Warfare

During the World War the United States alone exported to Europe 923,580 horses and 232,475 mules. On both sides there were engaged possibly four times this number of animals, or a total of 4,624,220.

In the late Civil War in Spain, Franco, with all the outside aid he received (principally mechanized), had to create finally a new balance in his forces in favor of animal elements before he could win the war.

Italy over-rated the versatility of her mechanized forces in her war on Ethiopia and had to create a new balance in favor of all sorts and types of animals, including oxen and burros.

Japan miscalculated her balance in mechanization in her recent and present wars in Manchukuo and China. As a result, she has greatly augmented her animal components in her present armies and has provided for the future production of military horses on a large scale.

Germany for many years has been one of the leading nations of the world in producing horses for military use. Her remount service during the reign of Kaiser Wilhelm II attained a high state of development and efficiency. During the Hitler regime the remount activities of Germany have been increased.—*Col. Edward N. Hardy, Chief of the U. S. Army Remount Service*

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

Cavalry Achievements in the Present War

When the German motorized blitzkrieg method of warfare took the world by surprise, England, France and the United States began to scrap their horse cavalry. It became motorized cavalry. The only veterinary company in the entire U. S. National Guard was disbanded.

While England and France were frantically giving up their horses, and mechanizing their armies so as to copy what they *thought* Hitler was doing, the German General Staff was actually *increasing* their cavalry. During the drives into Poland, France, Holland and Belgium, the Nazis used nearly a million horses.

When German tank columns in Poland bogged down in the prayed-for rain, and seemed about to become an easy prey to the Polish infantry, up galloped the crack German cavalry which had been attached to the panzer division for just that purpose, and drove off the Poles. And the first German troops to enter Paris didn't *rumble* in, as was expected; they *trotted* in.

It is now generally agreed that, if the British and Norwegians had had plenty of cavalry in Norway, the story of Hitler's attack on that country might well have been very different. Practically all Norwegian roads lie in narrow valleys, separated by steep wooded hills. Mechanized outfits couldn't move into those hills; cavalry could have operated under cover of the woods, unseen by the bombers of the enemy who held control of the air. They could have darted out and attacked the flanks of the motorized columns. They could have passed silently around these columns, to cut their communications and sources of supply.

And the final Russian answer to the German tanks appears to have been the Cossack cavalry. A horseman can circle a tank more rapidly than the tank crew can manipulate its turrets. Many German tanks are reported to have been put out of action in Russia by a bottle of gasoline, with a lighted fuse, heaved at the tank by one of these circling Cossacks.

The tacticians of the U. S. Army have been piecing together the dispatches about horses since the beginning of the war. As a result, last year they more than doubled the number of our cavalry horses, from 12,000 to 25,700; and more than trebled our cavalry personnel, from 13,500 to 42,500. And the end is not yet.—*The National Horseman.*

* * * *

More Army Mules Advantageous

The U. S. Army today has upwards of 7,000 mules—about half the number it had ten years ago. It has never discovered anything on wheels that can entirely replace the mule. The mule has no substitute as troop or cargo carrier in the jungle, desert or mountain pass. In Panama the mule has proved far better than trucks in climbing steep trails, and working through lush forests.

The U. S. mule is serving on both sides in World War II. The Italians, who used to buy 1,000 U. S. mules a year, made good use of this animal in the Ethiopian campaign and honored him afterward with a monument in a park in Rome. The Germans also have purchased a great many mules from the U. S. in the past, and wherever their 800,000 horses go the pack mules go along. Every year the British Army in India adds hundreds of U. S. mules to its thousands already in service.

Army Mounts Carefully Selected

GENERAL PERSHING'S MOUNTS

Left: Jeff, a gift of the Jefferson Foreign Post of the American Legion, was ridden by the Commander-in-Chief of the A.E.F. in the Victory Parade in New York. Right: Kidron, the most famous of the General's mounts, was presented to the General by the French Government and was ridden by him at the head of the Victory Parade in Paris, Bastile Day (July 14) 1919. Kidron, it will be remembered, was quarantined at Newport News for 140 days on his return from Europe—just when cities all over the country were demanding him to lead victory parades. Jeff is 31 and Kidron 33 years of age. Both have been retired from military service and are now at the Front Royal Remount Station, Front Royal, Va. This photo was taken in April of this year and shows the splendid physical condition of both animals at these advanced ages. Upon receipt of a copy of this photo the General wrote ". . . that they (Jeff and Kidron) are in excellent condition gives me much satisfaction"

Only about one-third of the horses examined by the Remount Division of the Quartermaster Corps for possible Army use are found acceptable and are purchased. As a result the animals procured for the cavalry and field artillery are among the best in the country.

During the fiscal year 1941 the Remount Division inspected approximately 70,515 horses and purchased 23,989.

* * * *

There are practically no horse-drawn transports in East Africa. Where there are roads motors are used, but over untraversed terrain pack trains — camel, ass or mule drawn—are utilized.

There can be no doubt that a completely mechanized army would have failed in Ethiopia; but a motorized army with an auxiliary animal transport succeeded. It required 100,000 camels, donkeys and mules to successfully carry out a campaign of but a few months duration.

Horse Power Is Needed

We are reminded constantly of the extensive use of airplanes in the present war. Of course they are proving of tremendous moment, the more the better—if they are ours! But the airplane and its crew require food, repairs and upkeep to "keep it flying." The scarcity of rubber, as well as the rough terrain over which material must be transported, make it desirable to use other than motor power for the transportation of supplies wherever practicable not only for the air but for other combat forces. With the great oil resources of the East Indies in enemy hands gasoline as well as animal forage must be transported long distances to the scene of combat.

It is quite evident that there is a need for the old-fashioned horse power — the kind that comes from feeding oats—along with the mechanical power and equipment.

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

FRONT ROYAL ARMY REMOUNT DEPOT

Veterinary members of the 11th Officers' Class, Medical Field Service School, Carlisle Barracks, Pa., inspecting the brood mares at the remount station at Front Royal, Va., April 16, 1942. Fifty-eight mares were due to foal at the station this spring. Seventeen had already foaled at the time of the visit of the veterinary officers and all had foals at their sides. The officer at the extreme left is Col. Wm. R. Wolfe, Depot Veterinarian. The other officer wearing a campaign hat is Capt. Wayne D. Shipley, in charge of horse breeding at the depot. The officer on his left is Lt. Col. Jack Fuller in charge of veterinary instruction at the Medical Field Service School

China Establishes Stations for Breeding Army Horses

In spite of the war China continues its scientific research on horses for war purposes at its seven new horse breeding stations. Here they are crossing stallions of foreign selected strains with local mares to breed better war horses for the Chinese Army. The stations are distributed over the nation's northwest and southwest pasture lands. Arabian, Tibetan and Mongolian horses are being used.

The first horse breeding station in charge of animal husbandry and cavalry officers is the Chuyung Horse Breeding Station formerly near Nanking; now in central Kweichow. Promising results are reported concerning the adaptation of Arabian horses to Chinese environment.

One station has 1,000 mares. Four foreign stallions among the sires at this station are now being mated with these mares. Native Tibetans are invited to herd the station's horses with their own stocks under the supervision of station experts to further the nomads' interest in improved strains. The station has a branch range at Mahsienshan (Horse Bit Mountain) which experiments with Mongolian horses.

In the Southwest, the largest horse breeding station is near Liuchow in Kwangsi. With 250 "mow" of pasture, three miles of track, veterinarians and hospitals, and a large number of stables, the station's 10 stallions of Arabian, Mongolian and Japanese origin and 100 mares produced about 500 improved foals in the last six years. Both inbreeding and mixed breeding are employed.

There are also stations in eastern Kwangtung. One of the objects of these stations is to determine the characteristics of the different breeds of Chinese horses. There are two main breeds in the Chinese horse family; the Mongolian and the Chienchang (Szechwan) horses—both of them descended

from the original Przewalsky horse that existed in Asia. The most proto-Mongolian horse is found in Kyrylun in outer Mongolia. It has good endurance and stands considerable hardship. Most of the Chinese troops in the northern provinces are using this breed. An ordinary Mongolian horse is now sold at $200 and more per head, the prewar price being $50 to $80.

The Szechwan horse is found in the Sichang district. Bred near the eastern Tibetan Plateau, this horse is short, small and stands only three and a half feet (although a few measure five feet in height). It has a big head, short neck and thick bones. It is steady and strong and at its best while traveling over mountainous regions.

Besides the two main breeds, there are also the Ili breed and the Tibetan breed, commonly known as the "Southern Barbarian Horse." The Ili horse is a mixed breed of proto-Mongolian and Arabic horses. The "Southern Barbarian Horse" belongs to the category of heavy horse and flourishes on the Tibetan Plateau.

China has 6,045,000 horses in her border districts, according to an estimate of China's Animal Husbandry Department. This figure does not include those owned by farmers.

Horse Breeding Among Crow Indians

At present when the demand for army horses is so great and motor trucking is rapidly being replaced by horse-drawn vehicles, it is of interest to note that the Crow Indian Agency is carrying on a horse breeding project over a larger expanse of territory than any other in the United States.

The reservation embraces 2,120,000 acres of well-watered, lush pasture of thick nutritious grass in the south-central part of Montana. The superintendent of this Indian country, tribal Chief Yellowtail, originated the extensive project when he was first appointed superintendent five years ago. He traveled thousands of miles in selecting quality horses. Purebred Percheron, Belgian, Shire and Morgan sires were purchased with tribal funds. Individuals bought purebred

Courtesy Country Life

Crow Indian color bearer

mares of these breeds. Since they are located on widely separated ranches, the stallions are transported in automobile trailers from ranch to ranch as needed.

The Belgian sire is Carmen Farceur, grandson of the famous Farceur, a roan, foaled in Belgium in 1910. At the time he was purchased by the Crows, agents came from Belgium to bid, as he had won grand championships in shows whenever entered. However, the agents gave up when the Crows bid $47,500.

The Percheron sire, Witch Hazel Olbert, was leading Percheron sire in the U. S. when taken to the Crow Reservation. Innisfail Nulli Secundis, the Shire stallion, came from the stud farm of the Duke of Windsor.

In addition to these and other purebreds, Chief Yellowtail secured hundreds of the best draft mares obtainable at the horse markets, and these, as well as the purebred mares, are mated to the famous stallions. The Crows are interested in breeding fine saddle horses also. They have many Morgans and a thoroughbred stud has been established on their lands.

These Indians are not content with breeding just fine horses. Raising beef cattle is one of their important industries. Marketing facilities are excellent since the main line of the Burlington is accessible and a highway leads to Billings, Mont., where extensive auctions are held.

Transportation of Animals Overseas

By OLIN ANDERSON, 1st Lieut., Vet. Res.

THE transportation of horses and mules from San Francisco to Manila, P. I., constitutes the longest ocean movement of military animals. The author was fortunate enough to be assigned as Transport Veterinarian on the U. S. Army transport *Meigs*, leaving San Francisco November 13, 1940, for Manila *via* Honolulu. While the *Meigs* is essentially a cargo vessel, she is the only transport in the Army Transport Service fitted to carry animals. On this voyage she carried, along with the general cargo, 264 horses and mules consigned to the Philippine Department of the Army, and one private mount to Honolulu.

St. Nazaire, France. During World War I days an American Veterinary Hospital and American Remount Station were located here

The animals had been received at the Presidio of San Francisco some 7 to 10 days prior to the sailing date. Since the animals came from the Fort Robinson and Fort Reno Remount Depots and necessarily crossed the Rocky Mountains en route, it can be understood readily that several cases of rhinitis were present upon their arrival at San Francisco. Unfortunately, it rained most of the time they were in the corrals. However, few complications developed.

The Army Transport Service docks are located at Fort Mason, some four miles from the corrals at the Presidio, and since it is not practicable to stop more than half of the Golden Gate Bridge traffic, the problem of getting the animals to the dock was difficult. It has been satisfactorily accomplished the past few years by means of a floating picket line carried between two trucks. This consists of a ¾-inch steel cable with one-inch cross bars about four inches long bolted to the cable at approximately eight-foot intervals. A spring snap is linked to each end of each cross bar. Twenty animals can thus be moved at the same time, two abreast, without congesting more than one lane of traffic. Two such lines were used. In this manner the 264 animals were moved from the corrals and loaded onto the ship in about seven hours despite the fact that one truck broke down and some delay was encountered at ship's side. One mounted man accompanied each string to help direct traffic and to head off any animal which might slip its halter. Such offenders, unless unduly excited, crowd into the moving string and follow along without causing trouble.

Upon arrival at ship-side the animals were unsnapped from the line and led by soldiers, one by one, onto the ship and down into the hatches. Loading ramps are made of wood and cleated; rough edges are covered with canvas when in use, and they are carried from port to port. Canvas wings are used in getting the animals started up the chutes. Once in the hatches the horses are placed in individual stalls and cross-chained.

The horse deck on the *Meigs* is the first

below the main deck, or, in seaman's parlance, the upper 'tween deck. Bulkheads divide the ship into six holds and hatches, four being forward of the engine room and two aft. The size of the hatches varies; No. 1 is smallest with 32 stalls and No. 5 largest with 68, the total number of stalls on the ship being 266. The deck is covered with wood planking supported on two-by-fours. Stalls are two feet wide by six feet long and eight feet from floor to deck above. The side boards, two by ten inch planks, are removable. The side board of one stall is also the side board of the adjoining one. In other words the animal is led into a space and a stall is built around it. This type of construction is used to facilitate cleaning and moving animals in and out. The back board is permanent and consists of a two by ten inch plank bolted to the uprights. Chains are bolted to the front uprights and the animals are cross-chained at all times except when exercised. The front stanchions are set back about two feet from the hatch combing, thus providing space for food and drinking buckets, and the rear stanchions are set out some two to three feet to facilitate removal of manure. To prevent injuries from kicking, the ship is lined with two-inch planking. The plank flooring in front of the animals is removable so the deck beneath can be flushed clean each day.

Forty enlisted men from the Overseas Discharge and Replacement Depot at Fort McDowell were detailed as stock tenders and one enlisted Veterinary Service man detailed as assistant to the Transport Veterinarian. The men were apportioned among the six hatches according to the amount of work involved. The day's schedule was as follows:

6:15 a.m.: Water, feed (six pounds hay per animal).
7:30 a.m.: Remove manure, exercise each animal 30 minutes, and groom as many as possible.
10:00 a.m.: Feed two pounds oats, one pound bran and ⅛ ounce salt to each animal.
10:30 a.m.: Water.
12:30 p.m.: Hose down decks with salt water (animals were hosed after warm weather was encountered).
2:00 p.m.: Exercise.
4:00 p.m.: Water, feed (eight pounds hay per animal).
8:00 p.m.: Water, police hatch.

In accordance with customary practice no grain was fed the first three days. No restrictions were placed on the amount of water consumed; animals were allowed to drink their fill. Buckets and G.I. cans were used, the cans proving most satisfactory. Crushed salt was used in preference to block salt, since the amount consumed could be more readily controlled. One man was kept in each hatch day and night to report illness, straighten out the animals that became entangled, etc.

All animals were clipped after leaving port. Four hand clippers and two electric sets were used. The legs were not clipped below the stifle or elbow nor was special attention paid the head. The main idea was to get rid of as much hair as possible before the animals started sweating. The fractious were given chloral hydrate for sedation and the more tractable were worked with a side line. The job was finished the seventh day out and the electric clippers accounted for nearly half the total number, but not because the hand ones were not kept turning. The hand clippers bogged down on a wet, sticky coat, while the electric ones ate their way through.

One private mount was unloaded by means of a flying stall at Honolulu. Because of the limited facilities and the short stay in port, the entire lot was not unloaded and rested. It so happened that we arrived on Thanksgiving Day when the stevedores were not working, and departed the following evening. To prevent injuries, boards were nailed in front of the stalls in the hatches where cargo was being worked. Food and water were given at the regular hours. The fine for dumping refuse in the harbor at Honolulu is $2,500. Consequently the job of cleaning ship the morning after sailing was quite a task. The animals apparently suffered no ill effects from the day and a half of idleness.

Exercise was accomplished by leading a number of animals around on the hatch cover while the stalls were being cleaned. The method was satisfactory as long as animals were led, but turning them loose

and driving them around did not work so well. The exercise periods were shortened the first week to afford time for clipping. Pine tar was applied weekly to hoofs and frogs. The intradermic mallein test was applied; no positive reactors being found.

The veterinary dispensary was located in hatch No. 6 in the stern of the ship. Supplies and equipment were adequate to combat the usual causes of injury and illness. Special items and some of the newer medicines were not available. A sufficient number of instruments were available for minor surgery, and although somewhat rusty from continued exposure to salt air, they were serviceable. Rust on a ship appears inevitable despite every precaution. The machinists swear their tools rust more readily when animals are aboard. This may be due to the ammonia and other gases liberated. Shovels which were new for the Panama run the month before were rusted through and useless before we reached Manila.

Cleaning the *Meigs* is difficult even under ideal conditions. The manure is shoveled into baskets and carried to chutes. The chutes are approximately 12 inches wide and 18 inches high and are located between the ribs of the ship in such a way that it is impossible to get the basket close to the skin of the ship; consequently when the basket is dumped a goodly portion falls back onto the deck. Scuppers are too small and are poorly placed. When hosing down, it is necessary to station a man at each scupper so that he may prevent clogging, and even then the process must be stopped frequently to prevent flooding.

Ventilation is accomplished by means of exhaust fans, port holes and deck ventilator pipes. Metal exhaust pipes are suspended above the stalls, lengthwise of the ship, and suction openings are present at intervals of from five to six feet. The hatch covers are kept off when animals are aboard, and while the fans suck out the foul air over the stalls clean air comes in through the hatch openings, port holes and manure ports. Wind scoops are used in the port holes and aid materially in increasing the volume of air circulation. Deck ventilators in each hatch help a great deal, provided they are turned whenever the wind shifts. It is impossible to keep the horse decks odorless; yet there is enough ventilation that the odor is not objectionable to the ship's personnel.

The usual cases of injury and illness that one would expect in a closely confined group were encountered: colics, indigestion, ringworm, bites, kicks and injuries from kicking over stall boards. Probably the most annoying condition was the cutting of the poll by the halter headstall when the animals reared back. Wrapping the headstall with cotton and muslin prevented severe damage. The animals affected with rhinitis upon embarking from San Francisco responded readily to simple treatment and the effects of shelter and warmth. One of the private mounts, although not exposed to the remounts, developed lobar pneumonia after leaving Honolulu. Treatment was successful. Ringworm was a different story; some was still present when the animals were unloaded at Manila.

Unloading at Manila proved an easy task; the animals needed no urging to leave the ship. The government area embraced the Army Transport Dock and the animals were led by Philippine scouts either direct to the government corrals, or across the dock and onto barges for shipment to Corregidor.

It is necessary that the horse decks be cleaned and disinfected before cargo is worked. The ship had been well cleaned before entering port, but since we docked in the afternoon and did not unload the animals until next morning, there was much to be done. There are no harbor restrictions in Manila, so the procedure was along the regular lines. As much manure as possible was shoveled overboard and the remainder hosed out of the scuppers. Disinfection was accomplished with a 2% creolin solution applied by means of spray pumps.

The close confinement for 28 days had no ill effect. Other than being leg-weary, the animals were in good condition, many having gained weight in transit. It is the author's belief that the cool weather prevailing during most of the voyage was responsible to a high degree for the general condition. A hot voyage probably would have a bad effect on tempers and result in many more injuries from kicking and rearing.—*Army Veterinary Bulletin.*

A. V. M. A. Scheduled To Meet August 17-20 Official Headquarters, Stevens Hotel Chicago, Illinois

Seventy-nine years ago, when 41 veterinarians from seven states met in New York City and established the United States Veterinery Medical Association (in 1898 changed to American Veterinary Medical Association), the dark clouds of the Civil War overhung all the land. In fact, the success of the meeting was due to the influence of the war in calling attention to the nation's need for veterinary service. Earlier attempts to form a national veterinary association had failed. But, in June, 1863, when this meeting was called, the Army of the Potomac required 500 horses daily for replacements and the Union Army in Tennessee an additional 150. Further, glanders, which theretofore had been rare in this country, was being spread by unserviceable animals sold by the army to every state and city, and was taking a fearful toll. The Quartermaster General had just said that the army's wastage of horses must bankrupt the nation and newspaper headlines screamed that the country would not long be able to feed the army or the civilian population for lack of horses to till the fields. The centering of public attention on the importance of animal disease in the national economy was responsible for the success of the meeting. It was many years before any subsequent meeting of the national association approached, in the number in attendance, the record set at this meeting in 1863.

Change in Procurement and Assignment Procedure

The national director of the Selective Service has ordered a change in the procedure of the Procurement and Assignment Service for physicians, dentists and veterinarians. Heretofore matters coming before state chairmen of the Procurement and Assignment Service were referred to the appropriate Corps Area Director of that service. Under the new arrangement state chairmen will deal directly with the state directors of the Selective Service.

The names of the chairmen of the Procurement and Assignment Service for each state were given in the May issue of VETERINARY MEDICINE, page 194. Any veterinarian who questions his classification by his local Selective Service Board should take the matter up immediately with the chairman for his state as given in that list.

Dr. C. C. Hastings, Secretary of the Illinois Veterinary Medical Association, in a letter to all veterinarians in Illinois, stresses the importance of veterinarians remaining "on the job" this summer. To quote:

"At this time, when human food of animal origin is so important, every possible precaution should be taken to keep our animal population in a healthy and productive condition. When foreign animal plagues could so easily be deliberately placed in our herds and flocks it is imperative that every veterinarian not actually needed in our armed forces be kept in daily contact with our animal life. Ordinarily a communicable disease is not difficult to control if proper measures are inaugurated early in the outbreak, and vigorously carried through.

"Veterinary practitioners are the Sentinels of our animal population and a sufficient number should be on duty at all times to guard the health of our animal contemporaries."

The Art, Science and Profession of Veterinary Medicine

The *art* of veterinary medicine is very ancient. It had already undergone considerable development when the earliest known records of civilization were made. The *science* of veterinary medicine is of respectable lineage. It ranks in age with the sciences of medicine, of agriculture, and of botany, and far antedates the sciences of aeronautics, electricity, nutrition, and many others that now bulk large in everyday affairs. The *profession* of veterinary medicine, on the other hand, is rated among the youngest of the learned professions.

Photo by U. S. Army Signal

81mm MORTAR SQUAD, FORT RILEY, KANSAS

Each cavalry brigade has six such squads, each triangular infantry division has 36. The mortars have an effective range of 1½ miles, and use three types of shells—7, 11 and 12 pounders. The first two are high explosive shells, the 12 pounder is a smoke shell used for screening movement

Use of Cavalry in the War

Lieutenant-Colonel F. W. Koester (U. S. Army Remount Service) is quoted as saying: "The Army is not concerned with the prevailing delusion entertained, perhaps, by the rank and file of our civilian population, that horses are obsolete and useless in modern warfare. From the military point of view, the Army could make no greater mistake. There is nothing extraordinary about the Army's sudden revival of horse-interest. It is merely a part of the rearmament plan that was started two decades ago. The production of horses cannot be speeded up in time of need like the building of tanks, airplanes and other manufactured military equipment; it is governed by nature, and it takes at least five years to produce a cavalry horse. But Army officers foresaw all this in 1920, and made provisions then to assure the supply now needed. Recent events have demonstrated the soundness of the War Department's policy adopted in early post-World War days.

"If anyone thinks this country would be safe without an adequate force of cavalry, and without a thoroughly organized, horse-drawn service of transport and supply, he must have overlooked certain recent happenings in Europe. Hitler has more than a million horses in active military service. He used more than 200,000 of them in the blitzkrieg against Poland. The German use of horses was also a major factor of their military successes in Norway, Holland, Belgium and France. There were no breakdowns in the Nazi cavalry, nor in the horse-drawn service of transport supply in any of the conquered European countries. The Nazis also demonstrated what well-organized cavalry is still capable of doing when it is used to follow up successes gained by aircraft and motorized divisions."

Japan, after experience with mechanized vehicles in certain parts of broken Chinese country, started a frantic and belated scheme to raise 7,500 stallions for stud service by 1945.—*Excerpted from Jnl. R.A. V.C.*, Feb. 1942.

* * * *

Russian Veterinary Service in War

The 40 cavalry divisions of the Russian Army have well organized veterinary services. Most of the treatments are carried out with the organizations in the field, but the graver cases are evacuated to veterinary hospitals in the rear. Especially constructed trucks, capable of transporting three animals, are used as veterinary ambulances.

Nine veterinary hospitals are located in the Moscow district. Some are for infectious and others for surgical cases. The latter are equipped with electrically controlled operating tables and x-ray and radiant therapy apparatus.

The Horse on Wheels

Taking the Army horse for a ride has extended the range of the newly organized cavalry regiment by 115 miles a day.

Well-trained cavalrymen and mounts can march 35 miles a day and, in an emergency, cover 125 miles in 48 hours. But the Army's horse and mechanized cavalry regiment can travel 150 miles a day at the rate of 25 miles an hour and push on to 300 miles in 24 hours on good roads, if necessary.

In giving a lift to regimental horses when the going is easy, cavalrymen can save them for more useful work when the going is tough.

Just as Jeb Stuart and Phil Sheridan made cavalry tradition by their masterful use of mounted units during the American Civil War, their modern successors in the Army are adapting the horse for use in military units unlike any other in the world today.

As organized by the American Army a cavalry division replaces the horse in some instances by tank, armored car, scout car, motorcycle and other motorized equipment providing more speed and greater striking power.

But the horse has not been forgotten, and Army men say that mounts are now being

Gas used on a hundred-mile auto jaunt will drive seven "jeeps" with seven machine guns or 37 mm guns and 21 fighting men 20 miles closer to the enemy

used to even greater advantage than in the days of Stuart and Sheridan. When there's work to be done, it's the horse that is called upon just as in the old days.

No other army in the world can match Uncle Sam's cavalry in the varied uses to which it can be put in engagements against an enemy. Through training maneuvers it has been determined which of the mobile elements of a horse and mechanized cavalry regiment can best carry out assignments.

The motorcycle, for instance, has been found to have great road mobility and can operate over narrow paths and trails. But on cross-country dashes, it is strictly limited. Furthermore, it is noisy and easily attracts enemy attention.

The scout car is best on the road and in cross-country trips it fares better than the motorcycle, although the terrain must be favorable. Off the road the scout car is slower than the horse, unless the terrain is exceptionally easy. The car, however, is very vulnerable to ambush; it cannot turn quickly on a roadway and speed out of danger. It is vulnerable to armor piercing .30 caliber bullets at close range, and is easily seen and heard when in operation.

The horse, on the other hand, has great mobility off the roads over all types of terrain. It is vulnerable to small arms fire, but its ability to run quickly to cover makes it a difficult target.

In designing the new horse and mechanized cavalry regiments for greater range, the main duty of such a unit was the first consideration. Its function is that of reconnaissance; and the farther it can extend and the easier cover all terrain, the better it can serve as eyes of the land forces.

Engaged in normal reconnaissance work, the regiment precedes the corps and is generally split into numerous detachments that may spread over an area of from 30 to 50 miles in width and up to 150 miles in depth.

Nearly 1,600 officers and men are assigned to the regiment. There are 574 horses and about 300 motorized vehicles (motorcycles, armored scout cars, portees for transporting horses and 4-ton wrecker trucks).

When on reconnaissance duty away from its base, the regiment usually carries supplies for two days. Rations for the men weigh far less than that for the horses and motors. Food for men weighs only 4 tons and forage for horses nearly doubles that. Fuel for the mechanized equipment, however, weighs nearly 28 tons.—*Res. Officer.*

When the Red Cavalry Charges the Toll of Animals Is Indescribable

By ERIC HARDY, F. Z. S.
Liverpool, England

THE thundering guns of the barrage die down. Behind concealment the Cossack cavalry have waited. Now they charge, their especially spike-shod shoes bearing the wiry Kalmyck horses over the ice. German guns open up again—centaurs of the Twentieth Century urge on their steeds to the victory you heard in the news bulletins last winter. But the aftermath of that great charge, that victory, is a battlefield littered with the mutilated bodies of men and horses—mostly horses. The aftermath of every cavalry charge was the death and mutilation of hundreds of horses whose bodies littered the snow-covered wastes. The toll of animals was heavy, the suffering of men and beasts immense—but " 'twas a glorious victory."

How often have the charges of the Russian cavalry carried the day on the Eastern Front? This war, which was to be a mechanized war of tanks and howitzers, has witnessed and is witnessing what may be the last great use of cavalry in mounted combat. The Red Army's Cossack cavalry has wrought havoc amongst the enemy lines. It has taken position after position and it has shown that, used properly under the right conditions, the mounted arm can still hold its own against the mechanized arm.

You have pictured *all* of this behind the newspaper stories and the daily news bulletins which have credited victory after victory to the Red cavalry. The cost of those victories has yet to be told. It is a story that galls the heart of anyone who saw the fine horses of the Russian steppes before the war. No other animal has paid such sacrifice in war as the Red Army's cavalry in the campaign in Russia last winter.

Let me invite you to join me in a visit to the Moscow Hippodrome in July of 1938—before Munich when it was not yet fashionable to pay compliments to Russia, much less her army. And why Moscow Hippodrome you might ask? Probably you've never heard about the great cavalry races held at the Moscow Hippodrome each July in the strange decade that preceeded Munich. I never saw anything of it in the official news when on the staff of one of the leading morning newspapers. All the news that came into their office was handled through the official news agencies. My story came from Moscow itself. And this is the story sent over to a leading horse magazine because the newspapers weren't interested in Russian army news.

Probably the largest horse-riding academy and breeding establishment in the world was at the Moscow Hippodrome and each July saw a magnificent equine event staged there. Tens of thousands of Cossacks had donned their sheepskin hats, soft kid boots and the colorful Caucasian coats of the Red Cavalry. They came to Moscow Hippodrome mounted upon magnificent animals reared on the hundreds of stud farms established by the Soviet throughout Russia. The government offered valuable prizes for these races to encourage the breeding and perfection of horses. Possession of a horse was extended beyond the monopoly of the wealthy class which had not been the case before the revolution. Specially spike-shod horses raced on the ice-covered Moskova River every winter starting in November.

It was clear that Russia meant business with the Red Cavalry. In all the countries of Europe the Tsar's Cossacks had been known as the centaurs of the Twentieth Century; and when the new life of the post-Revolution threatened to part the Cossack from his steed, the Soviet found a use for the man who could not live long out of the saddle—for the rider who loved his horse more dearly than the Arab loved his steed.

They found him a job in the Red Cavalry. And each July at the Moscow Hippodrome the remarkable demonstrations of the Cossacks showed they had lost little if any of their fighting value since the days of Ivan the Terrible.

The favorite horse for the Red cavalry is the Kalmyk breed, a native of the south which originates from the Mongol horses brought by the invasions of Ghengis Khan and crossed with native animals. The Kalmyk is content to eat once a day and it is a veritable camel where water is concerned. Tough, hardy and fearless, it can keep up its curious stride from dawn to sunset over the steppes and thus cover astonishing distances.

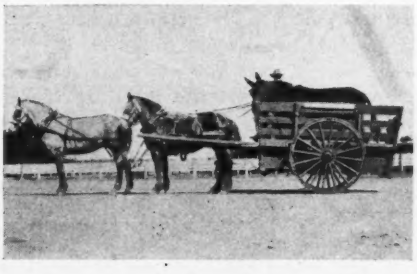
Of all the nations now in the second world war, the Russian armies employ the greatest number of horses. They have come from the steppes, from the Caucasus, from the plains of the Ukraine, from the slopes of the far distant Urals, in thousands and tens of thousands. There are vast reserves of horses. Trustful as children, blindly obedient, they have suffered hardships and agonies which are indescribable. In a battleground where the temperature often records—60°F. with bitter black polar winds, they have waged war successfully against mechanized forces in districts where food and shelter were scanty or non-existent.

The bitter fighting on the Eastern Front has taken a terrible toll of horses. In her need for veterinary help, Russia has turned to her Allies. And the friends of the horse, such as the Royal Society for the Prevention of Cruelty to Animals in London, have gone to their aid regardless of cost, or of funds available, but trusting that animal-lovers the world over will back them up because there has been no time to wait in a war of endless action. Large quantities of drugs and medicine have gone to help Russia's horses. Thousands of pounds will be spent equipping five new field hospitals for the horses, along with vitally necessary surgical instruments. The Russian cavalry are to have 30 sets of Roentgen machines, 200 assortments of surgical instruments for the field hospitals, 100 field microscopes, 2,000 veterinary surgical outfits, 3,000 reflectors, 2,000 fully stocked veterinary surgeons' haversacks, 1,000 tracheo tubes, 2,000 veterinary phonendoscopes and several tons of disinfectants.

Russia began the war with an organized veterinary service, well-equipped and splendidly managed. That service still exists, but the terrible weight and ferocity of the German invasion made serious inroads into its resources, and a fund (with Mrs. Winston Churchill as vice-president) has been launched to provide the money for the new field veterinary hospitals and for large quantities of drugs now difficult to obtain in Russia.

Think for a moment of the scene that preceded the news flash of another sweep by the Russian cavalry. Think of the horses and the riders hiding behind concealment, ready to emerge and charge at the right moment. And with the command to charge the wiry Kalmyk beasts stride forward, driven on by mounted Cossacks with their rifles slung over their shoulders. A crash of cannon! the aftermath—animals mutilated by shell fire!

Russia has vast reserves of horses. The men of her observation posts are mounted upon fine riding horses. The Cossacks and their horses both wear gas masks in their gas drills. Guns and men move up the line with horses. Horses transport the heavy materiel at the rear. They evacuate the peasants before the battle. They go on where tank and train find the terrain impassable. They know nothing of the cause. They go forward to final victory or mingle their ashes with those of their riders. They endure much and die in great suffering in a quarrel that is not of their making, that man might again live free.



Horse Ambulance of World War I

Experiences in an Army Veterinary General Hospital

THE 30th Veterinary General Hospital was activated at Fort Bliss, Texas, June 1, 1941, with eight officers and four noncommissioned officers. I joined the organization two weeks later and a month after that the executive officer of the hospital, Major Fred B. Green, died, and the commissioned staff was again reduced to eight officers.

July 27, 118 enlisted personnel were received from the Medical Replacement Center, Camp Grant. All but two were from the Selective Service, about half originating in Chicago, and the remainder chiefly from North Dakota, Montana, Minnesota, Wisconsin, Missouri, and down-state Illinois. In schooling they varied, from one graduate each from a college of physical education, the University of Minnesota, University of Wisconsin, and University of Chicago (the latter with a master's degree), to some who had not completed the eighth grade in rural schools. The Chicago contingent included members of several of the skilled trades, sign painter, electrician, steel worker, mechanic, carpenter, cabinet maker, mason, welder, cook, etc., and two professional musicians, one an orchestra leader of national reputation. The rural contingent comprised chiefly farmers and stockmen, a few truck drivers, three horse trainers, a sawyer from the state of Washington, a mountain man from West Virginia, etc. Among them they could speak, besides English, most of the important languages of Europe and two Indian tongues.

Eight days after the enlisted men from Camp Grant joined the hospital, the organization left Fort Bliss for the Louisiana Maneuvers in a motor convoy 73 miles long and containing more than 1200 vehicles. It took two days to cross the desert and three more to reach De Quincy, Louisiana, where

SOME OF THE BUILDINGS AT THE 30TH VETERINARY GENERAL HOSPITAL, FORT BLISS

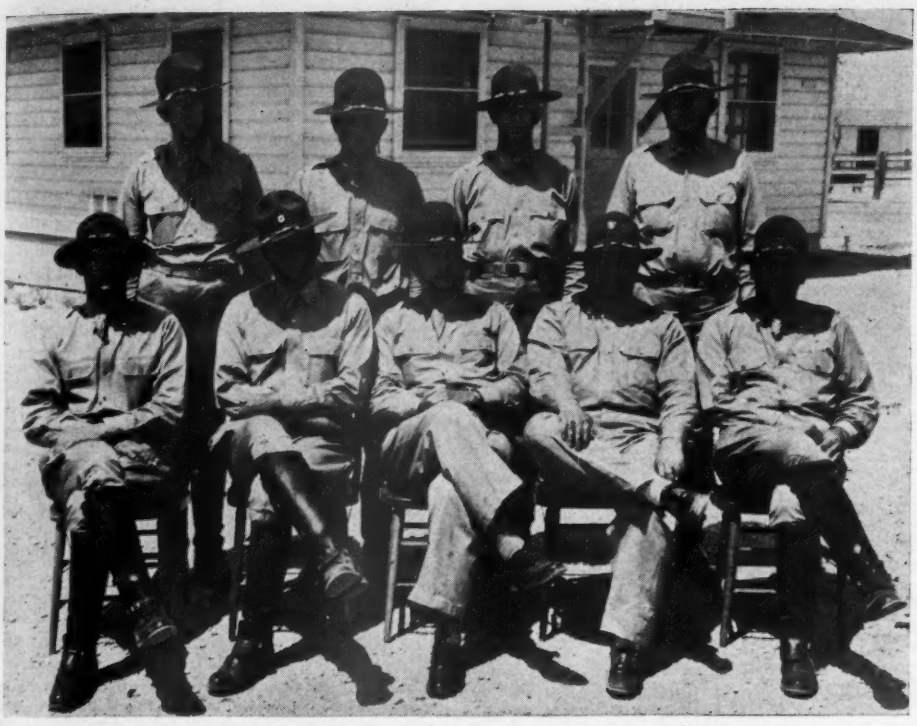
This view of buildings of the 30th Veterinary General Hospital is taken looking due north. The buildings shown include (left to right): the Recreation Building, the West Barracks, the East Barracks, the Administration Building, and the Mess Hall at the extreme right. Five 30-stall ward buildings (surgery in each) are not shown

the hospital was set up for the treatment of animal casualties. There was considerable discomfort in spending early August days under a blazing desert sun, traveling at what seemed like a snail's pace but we hadn't been in the swamps long till we would have traded our equity in the whole of the state of Louisiana for a few square miles of that desert and a chance to get our clothing and bedding dry.

The veterinary general hospital is the largest installation in the army veterinary service, comprising, according to the tables of organization, 269 enlisted men and 11 officers. When set up fairly compactly it occupies an area of about 30 acres. It is located far enough to the rear of the combat zone to be unaffected by temporary advances and withdrawals of the front line. The plan for its operation contemplates that it will be housed in buildings constructed for that purpose and will not move so long as the army which it serves remains in the same sector. For a field veterinary unit it has extensive equipment and it is expected that the standard of veterinary medicine and veterinary surgical practice in it will be equal to the best to be found anywhere.

The 30th Veterinary General Hospital did not meet all of the standards laid down for such an organization. Because it was oper-

[1] From an address by D. M. Campbell, Chicago, at a National Defense meeting of the Keystone Veterinary Medical Association, Philadelphia, April 29, 1942.



OFFICERS OF THE 30TH VETERINARY GENERAL HOSPITAL

Seated, left to right—Capt. Joseph F. Neiberding, Major Fred Green, Lieut.-Col. D. M. Campbell, Capt. Tom Evans, Lieut. Louis B. Bate. Standing, left to right—Lieuts. H. B. Brown, John A. Utterback, G. C. Coburn, and John P. Denton. (Photo taken before the commissioned personnel was complete)

ating in maneuvers and not battle conditions and was going to close after only about 50 days, buildings were not constructed; the personnel lived in tents and patients were kept on picket lines. Since it was organized for training purposes only and, at that time, participation in maneuvers was not contemplated, it was far under strength in enlisted personnel. Further the hospital and many other rearward installations were located much nearer to the zone of action than probably would be the case in actual warfare—at no time more than 100 miles from the "front line." This necessitated moving the hospital three times as the fortunes of the combat troops varied. It also made practical the evacuation of animals by trucks, instead of by rail, as would likely be the case, at least in part, under war conditions. Because it had been so recently organized and a large percentage of the enlisted personnel were wholly unfamiliar with the handling of animals it required some time to strike its stride but during the last four or five weeks of its operation, the quality of the medical and surgical service of the hospital and of the animal management was the equal of that to be found anywhere on the continent. Further the clinic was probably larger than any other on the continent; larger perhaps, than the equine clinics of all the veterinary colleges in the country combined. The standards of animal management that prevailed were a model of what such standards should be. The U. S. Department of Agriculture took many reels of motion pictures in the camp to illustrate approved methods of grooming, feeding, watering, shoeing and all other matters of animal management.

RECEIVING LINE 30TH VETERINARY GENERAL HOSPITAL, LOUISIANA MANEUVERS 1941

Horses were brought to the hospital during maneuvers in trucks of the type shown in the illustration. The E.V.T.'s and Preston brands were verified, the property checked, and a receipt for the animals given the NCO in charge of the truck. The animals were then examined and distributed among the wards for treatment

Allowing for a beginning with only a few patients and for several days lost due to changes of location, an average of 60 animal casualties was received at the hospital daily. These were moderately severe to very severe cases; grave enough to be evacuated an average of 75 miles for treatment. Some days, or nights rather, for most patients arrived at night, a much larger number was received. One night 173 cases were admitted and the night the hurricane struck the camp, 130 cases were received between 9:30 P.M. and 4:30 A.M. The fact that several tents were blown down during the night and the next morning twelve-quart buckets, setting about the camp, were found filled with rainwater to within two inches of the top, indicates the kind of a night it was to be treating animals in the open.

Except just after moving and setting up the hospital anew, from 375 to 600 cases were under treatment most of the time. Sometimes the number was larger; when maneuvers ended September 30, there were 754 horses in the hospital. A total of 1905 animal casualties were admitted and 1885 were returned to the organizations from which they came. Of the 20 cases that were lost, three died in the hospital and 17 were destroyed, as incurable, or not worth shipping back to Fort Bliss, or because of their ailments, were non-transportable cases when the maneuvers ended.

A veterinary general hospital operates almost continuously day and night, during active phases of the operations up ahead of it. The personnel, perhaps, worked the longest hours of any group on the maneuvers. This was well expressed in conversation overheard among several soldiers busily grooming horses. One said, "Say Bill! What day is this, Sunday or Monday?" Bill, after some hesitation, replied, "I'm not sure but I think it's Tuesday, maybe Wednesday." Another chimed in, "Aw hell! What's the difference? It just gets light, then gets dark, then gets light again."

About 10 days after maneuvers began,

"DUTY LINE" AT THE 30TH VETERINARY GENERAL HOSPITAL

Each morning during maneuvers all animals fit for duty were selected by ward officers from those in the hospital and tied on the "discharge" picket line of the Receiving and Evacuation Section. Here each animal was given a careful physical examination, first by the officer in charge of the section and second by the Executive Officer or by the Commanding Officer, and if passed as sound was turned over to the Remount Service to be returned to the organization to which it belonged. Animals to be discharged must (1) have recovered from the disability for which they were under treatment, (2) be free of any other disability, (3) be fit for full duty (conditioned if they had been in the hospital more than 10 days), (4) be properly shod and (5) possess a serviceable feed bag and halter and be faultlessly groomed

Major Austin T. Getz was assigned to the hospital as replacement for Major Green, deceased. A medical officer and medical enlisted personnel also were assigned to the hospital at about this time. Four additional veterinary officers were assigned to the organization for periods of two to four days. The acute shortage was always in enlisted personnel. Notwithstanding the men worked hard and very long hours, the discipline of the organization was highly commendable. There were no desertions, only one AWOL and that for only one day, no cases of venereal disease and no trials by courts-martial.

Three conditions met with on maneuvers —nail pricks, exhaustion and laminitis, and contused wounds of the back and withers—possess features that seem to be of considerable interest. The treatment used in these conditions is indicated in a general way in the following discussion.

Treatment of Foot Injuries

"Foot cases" are responsible for an enormous wastage of army animals. On the Western Front in World War I, foot injuries, chiefly nail punctures, averaged 400 cases a week in the British army in 1916 and 1917 and later reached a height of 800 cases weekly. These astonishing numbers include only cases admitted to the veterinary general hospitals, i.e., cases severe enough to justify evacuating some 200 miles and requiring treatment for a period of at least two weeks. Statistics for the A.E.F. are not available but from the testimony of American veterinary officers who served in France, one judges that "picked up" nails were as common among our animals as they were in the British forces.

The great prevalence of nail punctures among American and British animals was due in part to the type of field kitchen (rolling kitchen) then used, but since discarded. Meals were cooked as the organization moved, broken up packing cases being used for fuel. The nails were not removed before the wood was burned and when the ashes were dropped along the roads they became heavily seeded with nails. Although such practices do not obtain at army posts in peace time, and notwithstanding much effort has been expended in picking up scattered nails at all American army posts during recent years, nail punctures are still a frequent cause of ineffectiveness in our army animals. During the year ending June 30th, 1941, more than a thousand cases occurred, resulting in nearly 15,000 days of idleness, although the mean animal strength of the Army was then only 25,000. That year nail pricks ranked fifth in importance among external injuries to army animals.

Picket lines at the Calcasieu camp

The "foot cases" reaching the 30th Veterinary General Hospital during the Louisiana maneuvers numbered in the hundreds, affording an opportunity to observe the results of different methods of treatment in many parallel cases. This observation led to the conclusion that the treatment of wounds of the feet can be characterized in many instances as "too much and too late." It also soon led to the general plan of treatment of nail punctures described in the following. It is in major aspects a method of handling these cases advocated some two or three years ago by Mitchell of Edinburgh, Scotland.

It is rare that a nail entering the sole of the foot carries infection beyond the surface

Left to right: the Medical Dispensary and ambulance; a corner of the Junior Officers' tent, the Executive Officer's tent, and the Commanding Officer's tent. The picket lines were in the rear of these tents

layer of the sensitive sole. Any attempt to follow the tract of a fresh nail puncture with a hypodermic needle, and inject iodine or other disinfectant into it is extremely ill advised. To open the tract with currette, probe, or scalpel is still more undesirable. A more common error is to delay treatment because of difficulty in locating the site of puncture until infection has developed and

AT WATERING TIME

Watering the animals is a heavy chore in an army veterinary hospital. Even if water is available at the hospital site most of the animals will have to be led 100 yards or farther and since, in the summer climate of Louisiana, they require watering at least four times daily it may require up to 200 man hours each day when the number of animals in the hospital reaches six or seven hundred. Watering is facilitated if 20 to 30 animals can be watered simultaneously. To accomplish this the tank illustrated was built of canvas. The water for this tank was hauled 10 miles and 5000 to 8000 gallons was required daily—seven to twelve trips for a tank truck. Hauling this amount of water required the full time of two men from 4:00 a.m. to 9:30 p.m.

perhaps suppuration has occurred. This is a common result of relying too much upon hoof testers to locate the wound.

Since relatively few nails penetrate the frog the overwhelming majority of nail pricks will be found in that portion of the foot lying between the frog and the shoe. When a nail penetrates the horny scale and enters the sensitive tissues the animal invariably goes lame and the rider or driver should, and usually does, recognize that the animal is injured. Ordinarily the rider will make some search for the nail and in most instances, find and remove it. He may attempt to pour turpentine, iodine, or other panacea into the hole left by the nail. Since the wound in the soft tissues closes as the nail is withdrawn this in itself does no harm. However, after the nail is removed the animal walks better than before, his rider may conclude the turpentine has cured the injury, and continue to work the horse. Thus the veterinary officer may not learn of the injury till the next morning, or later, when the lameness reappears in a more severe form than before. By this time the most propitious period for treatment has passed.

When a horse, or a mule with a recently punctured injury of the foot, is brought to the veterinary officer for treatment he is usually confronted with a task of some difficulty in locating the wound. If the injury is from a horse shoe nail driven too deep, or if the injury is in the frog, or if pus has already collected between the sensitive and insensitive sole, locating it may not be difficult and he may be able to find it without removing the shoe. However, locating a puncture in the sole often may be extremely difficult and time consuming unless the shoe is removed. Further proper treatment, except trivial cases, cannot be accomplished without this being done. Therefore, removal of the shoe as a first step in the treatment should be routine.

After the shoe is removed the foot should be washed thoroughly; using soap and water and a stiff brush; then inspected carefully. If the puncture occurred more than an hour previous to the examination it is unlikely that it can be seen by such inspection. The next step is to pare off the rough surface of the sole. Following the rough trimming, if the wound is not easily detected, the entire surface of the sole should be searched systematically with hoof testers for sensitive areas (sometimes there is more than one nail-prick). When a point is found where the animal flinches on pressure it should be returned to several times, after testing other areas. With the sensitive area definitely located, careful paring of the whole surface of the sole is continued until it will spring under strong pressure from the thumb. The wall should not be lowered during this process. When the sole is uniformly thin and clean, careful search in the sensitive area should reveal a small spot where the grain of the horn is broken,

and instead of the pared surface being smooth and slick an area one-sixteenth to one-eighth inch in diameter will appear slightly fuzzy. This marks the tract of the nail.

An area about an inch in diameter, with the puncture in the center, should be thinned further as much as possible without causing hemorrhage. Of course if suppuration has already occurred it will have been discovered before this, but assuming the puncture is not more than 48 hours old, the next step is to remove a small disc of the remaining horny sole. It should not be more than three-eighths inch in diameter, the puncture wound being in the center. This removal needs to be skillfully and painstakingly accomplished with a sharp-pointed bistoury. Hemorrhage should be avoided for if it occurs the operation will be delayed until it can be completely arrested.

Removal of this disc of horny sole will uncover the infective material in the wound. In traversing the horny sole the nail pushes ahead of it some foreign material—dirt, perhaps broken bits of the outer sole or flakes of rust. When the nail strikes the sensitive sole the latter springs away from the horny sole and the foreign material is pushed aside between the two soles. Passing on into the sensitive tissues the nail carries a minimum of infection—an amount which these tissues that have an extremely rich blood supply and great reparative powers, in most instances, can overcome readily.

In untreated cases it is at the point where the wound enters the sensitive tissue that the abscess forms. In the treatment of these wounds one often finds considerable quantities of pus (a half dram or more) and the animal in great pain, yet when the pus is evacuated the sensitive sole may show no injury. If the case be not treated, if drainage is not established from below, the infection is forced along the injured tissue in the tract of the nail and ultimately discharges above the coronet, commonly resulting in quittor or the formation of a fistula at the heel. No veterinary officer should boast of the number of successful quittor operations he has performed because, with few exceptions, each is a signboard pointing to an improperly treated nail prick or corn.

With the site of infection exposed any visible foreign matter is removed and the area thoroughly irrigated with a normal saline or other nonirritant solution. Then the area is dried and dusted lightly with sulfanilamide and covered with a pad of gauze about two inches in diameter and folded six or eight thicknesses. A dilute solution of alum is as satisfactory as any with which to moisten the gauze. Since it is essential that this dressing be nonirritant of course iodine is eliminated. If infection has already developed at the site of penetration more sulfanilamide should be used. The gauze should be covered with dry cotton and the cotton in turn covered with oakum dipped in pine tar and plastered down evenly and smoothly. The purpose being to form a water-tight seal for the protection of the wound. If tar is not available heavy cup grease is a fairly satisfactory substitute.

The shoe is then replaced and the dressing held in place by a metal strip, the ends of which are forced between the shoe and

the sole. A section of metal barrel hoop makes a good retainer for this purpose. Further careful packing with dry oakum can render the dressing very secure. In most instances the animal will travel sound and may be returned to duty within four days, the dressing being left in place until it wears off. If the horse is still lame at the end of a week the dressing should be removed and the wound examined. If there is no suppuration a new dressing should be applied, but if suppuration has developed it should be treated as described later for abscesses in this location. In cases treated before there is a collection of pus between the two soles, suppuration is rare.

Where the nail has penetrated the plantar aponeurosis, or possibly even impinged upon the navicular bone, the lameness may persist for as long as four weeks and then disappear suddenly without having had any external evidence of infection. If the wound does not clear up in a month an operation following the course of the nail injury to its terminus is indicated and is usually entirely successful. The operation should not be delayed longer since atrophy begins in the hind leg after about five weeks of nonuse. Recovery from atrophy of the gluteal and femoral muscles may require many weeks.

In cases where treatment has been delayed until an abscess has formed and the animal is in great pain and refuses to bear any weight on the limb, the routine of treatment is much the same. In paring away the insensitive sole, all that has become separated from the matrix, i.e., undermined with pus, must be removed, and in the cases treated early, the margin of the opening in the insensitive sole must be reduced to paper thinness. If this margin be left thick and unyielding, regeneration of horny sole is delayed. If any part that has been separatd from the keratogenous membrane is allowed to remain suppuration will continue under it, or rather over it.

In dressing the wound where suppuration is active a considerable amount of sulfanilamide is packed into it before the gauze is applied, otherwise the routine is that already described, except that the dressing should be removed after a week and a new one applied. The dressing should be changed sooner if the lameness increases markedly or the temperature rises sharply. Chronic cases where the pus has burrowed high into the tissues of the foot require daily dressing for four to five days or longer.

Usually where the pus is limited to the space between the sensitive and horny soles and not more than one-third of the sole is removed nail puncture cases may be returned to duty in two weeks. The foot should be shod with a light metal or heavy leather pad covering the whole sole. Space between the pad and the sole is packed with tarred oakum. If a metal pad is used a V-shaped notch should be cut into it to expose the frog.

The treatment throughout should be conducted with the same regard for asepsis as would be observed in treatment of any other wound or in performing an operation elsewhere on the body. There is no more occasion to use irritant disinfectants in nail pricks than in other wounds. Turpentine, powdered copper-sulphate, pure phenol and other irritants have no more place here than in a wire cut. They delay recovery for days or weeks. Frequent changes of the dressing are rarely necessary and if unnecessary are objectionable. The case should be treated thoroughly and painstakingly the first time and let alone thereafter unless by the nature of the wound or the increasing discomfort of the animal, redressing is definitely indicated.

NINETEEN CASES OF LAMINITIS

All these animals were received in a single night. About half of them were affected in all four feet. The photograph was difficult to get since several of the animals could not be induced to stand longer than a minute. Two horses it will be noted could not be kept on their feet even for this period and after several trials had to be photographed lying down

Exhaustion and Laminitis

The animals employed in the maneuvers arrived in Louisiana during hot humid weather that followed a long period of daily rains. At Fort Bliss, they had experienced hot burning sunshine at an elevation of 4000 feet and an exceedingly dry atmosphere. In Louisiana, the elevation was less than 100 feet and the humidity always above 90% and compared with conditions on the desert there was little bright sunshine although, except for one week during maneuvers, the weather was rather dry. The nights as well as the days were warm.

The striking fact in connection with the cases of heat-exhaustion that developed in Louisiana, was their extreme severity during early phases of the maneuvers and the gradual fairly uniform decrease in severity as the maneuvers progressed and presumably the animals became better acclimatized.

Heat-exhaustion is prone to have a number of complications — laminitis, delirium and convulsions, synovitis, nephritis and muscular soreness being the most common. Laminitis as a complication of heat-exhaustion is a fairly accurate measurement of the severity of the attack—the more severe the heat-exhaustion—the higher the percentage that develops laminitis. On this basis the greater severity of the cases of heat-exhaustion early in the maneuvers is strikingly apparent. Of the first 31 cases of heat-exhaustion 30 developed laminitis. Of the next 70 cases 30 developed laminitis and of the remaining 145 cases, only 17 developed the disease. The severity of the cases of laminitis varied with their frequency. Of the first 18 cases 12 were affected in all four feet and eight of these were eventually destroyed (several of the animals suffered from other complications also). Of the next 40 cases only five had quadripedal laminitis and one had to be destroyed. Of the remaining 20 cases the inflammation was confined to the front feet and all recovered.

Of the first hundred cases of exhaustion to be admitted to the hospital, all were cases of heat-exhaustion—i.e., mineral depletion owing to excessive perspiration. The last hundred cases were quite different. They were mainly cases of exhaustion due to debility—just an end result of overwork, underfeeding, neglect and lack of rest. The remaining 66 cases coming between the first hundred and the last hundred included both types of cases.

Our treatment for exhaustion was simple, albeit, laborious. Cases of every degree of severity reached the hospital. Some were

already improving and would undoubtedly have recovered without any treatment other than rest and shade. Such cases were few. From them the range extended to the most severe—cases that seemed to have not half-a-dozen hours to live. In fact, 64 cases of

TYPICAL ATTITUDE ON THE SECOND DAY OF AN ATTACK OF LAMINITIS

This animal was a victim of exhaustion about noon, and evacuated to the hospital during the night. It was severely affected with laminitis when unloaded and was given a 10% saline injection immediately and another early next morning. On admission the feet were packed in ice, which had melted, but the sacks it will be noted had not yet been removed when the photograph was taken

exhaustion died before they could be evacuated to the hospital and some while being transported. All cases that reached the hospital were treated, whatever their condition, and none died of the primary ailment. The mild cases were returned to duty routinely on the fourth day. At that time they did not pant or blow more than normal when exercised. The severe cases (not complicated by laminitis) or those in which the laminitis cleared up in three to four days, were returned to duty within two weeks; a smaller number required twice this period for recovery and as will be seen nine cases were destroyed because of complications. Thus approximately 90% of the cases of laminitis recovered and more than 97% of the cases of heat-exhaustion were returned to their organizations as serviceable animals.

Immediately a case of exhaustion was unloaded it was given intravenously 1000cc (if mild) and 1500cc (if severe) of a 10% salt solution. In the majority of the severe cases no pulse could be detected and in at least 25% of them only thick dark blood could be made to flow in drops from a large calibre needle inserted into the jugular vein. Within 15 minutes and sometimes by the time the intravenous injection was completed these animals would walk to the watering tank and drink gallons and gallons of water; within a half hour they would drink as much more and then many of them would eat hay immediately. The improvement in the circulation was extremely rapid. Those that would not eat, were given a second intravenous injection after an hour, and a third two hours later. A few cases were given five injections within 24 hours. A good many that had only the two injections and that looked all right the following morning would commence blowing in the afternoon when the day became really hot and then would be given a third injection.

More than 50 of these cases of exhaustion were suffering from laminitis when they were unloaded at the hospital. Half as many more developed this condition within 12 hours after reaching the hospital. None developed laminitis more than 12 hours after being treated for exhaustion. The majority of the cases of laminitis were extremely severe when they were unloaded. A smaller number were mild but all were worse within 24 hours. The cases complicated by laminitis received the saline injections the same as the others, but since they were the more severe cases most of them received as many as three injections (4500cc in all) of a 10% saline solution. Since about one-fourth of them could not walk and some could not even stand, water had to be carried to them and thus it was noted they sometimes drank up to 15 gallons in the first hour after reaching the hospital.

The feet of these laminitis cases were packed in ice immediately after the first saline injection was completed; about 10 pounds of ice being used for each foot. This treatment was not repeated but the next

day and every day thereafter, forced, but gentle, exercise was given. Even if the animal required help to stand it was forced to its feet and with one man on each side, one in front and one behind, it was helped along for a matter of 50 feet, three or four times daily. Those that could be led received about 10 minutes exercise as often—oftener if the walking was not too painful. Animals that had laminitis were not tied but turned loose in the fair pasturage available and encouraged as much as possible to take voluntary exercise.

In evaluating this treatment it would appear that the 10% saline injection (sodium chloride 4%, sodium carbonate 5%, potassium chloride 0.5% and magnesium chloride 0.5%) must be given the place of first importance. It removed or overcame the cause of the condition. The frequent periods of gentle exercise, however, must be

A good type army remount

given a good deal of credit. The opportunity was afforded recently of observing about a dozen only moderately severe cases of laminitis treated routinely and placed in a concrete soaking vat several hours daily. All developed dropped sole and were destroyed. It is not possible to say if the application of ice to the feet was curative. On one occasion when the supply of ice was insufficient in some eight or ten cases only one foot was packed in ice the other constituted a sort of control. There was no difference in the course of the disease in the feet that were and those that were not packed in ice. However the ice treatment was well worth while for the relief it gave the animals. It is a humane measure that should in no case

Courtesy Horse and Mule Association

Sunday morning riders

be neglected. Perhaps the salt ration given the animals after the acute attack of exhaustion had subsided would not be considered a part of the treatment, however it was an important part of the aftercare. They were given all the salt they wanted and at first would fill their mouths and eat it as a hungry horse does oats or shelled corn. They consumed up to three pounds each during the first four days in the hospital but thereafter only a normal amount.

Summarizing the cases of laminitis: Of the 78 cases more than half of the whole number were of more than average severity; at least one-fourth were extremely severe. 69 recovered and nine were destroyed, because (1) the attack appeared to be incurable, (2) other complications, (3) the animals were of small value and their recovery doubtful, and in all cases to prevent further suffering. Of the nine destroyed, all had quadripedal laminitis. Three suffered from acute nephritis of an intractable type. Two developed a spastic paralysis that resisted treatment and one suffered from severe injuries about the head from running into trees during delirium. Two probably would have recovered without deformity of the feet but being undersized, of poor conformation and somewhat aged, the prospect was not deemed worth the expense of treatment and later shipment to Fort Bliss.

A majority of these nine cases developed severe, extensive decubital sores, in spite of the fact they were turned over frequently during daylight hours—an indication that to avoid decubital sores in animals that are down continuously they must be attended both day and night.

Contused Injuries of the Back

Of contusions, and abscesses of the back and withers there were 366 cases or 19% of the total admissions during maneuvers. Although these injuries constituted about one-fifth of the cases admitted, they were responsible for a large proportion of the animal patient days; possibly more than 80%.

The policy was adopted of treating all of these "back cases," regardless of their apparent severity, on the ground that the outcome of such injuries is, to a considerable degree, unpredictable. The results of the treatment supported this policy. At least it demonstrated that an accurate prognosis could not always be made since some cases that looked nearly hopeless made good recoveries and others that certainly appeared no more severe took months to recover. The percentage of unpredictable cases was not large but the number was sufficient to justify treatment of all cases, for at least 30 days, before condemning the animal.

Veterinary officers must never lose sight of the fact that the primary function of the medical man is to cure. It doesn't require a college course to aim an automatic. Killing animals is a confession of failure.

BACK CASES

Upper left: Typical contused wound of the withers. Many such injuries were incurred by the cavalry horses during the Louisiana maneuvers. They occurred most frequently about the withers but were common on the ribs and beneath the cantle

Upper right: Anesthizing the surgical field. Note the large area that is shaved and disinfected. These operations were rendered practically completely painless by the use of novocaine. For an operation of this magnitude about 100cc of the solution was required. None was injected into tissues that would later be invaded by the scalpel. The surgeon is Lieut. John A. Utterback

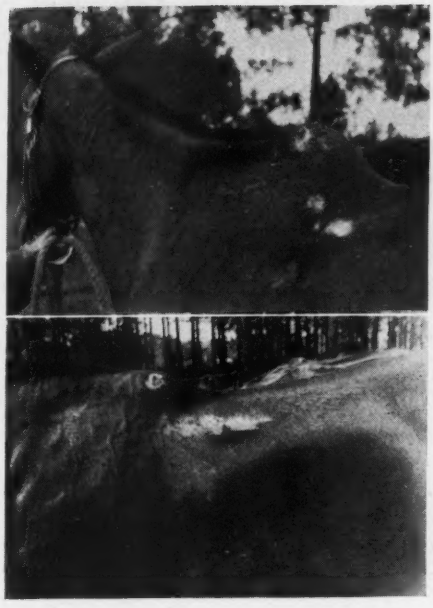
Lower left: Showing the skin incisions. Note the incisions do not go to the top of the withers. Uninjured tissue at the top limits movement of the parts. Movement of a properly treated wound at this location is the chief deterrent of rapid healing, hence the incisions are made as low as the nature of the injury will permit and only injured tissue is removed. Often even when the swelling is great very little tissue requires excising. The protective towels used during the operation have been removed to permit better photographing of the area

Lower right: An operation on a particularly serious case. Wounds of this width require a long period to heal. Although the swelling in this case was only moderate the surgeon found much injured tissue which required the excision of a wide strip of skin and underlying structures. Continuing the incision to the midline on the withers also is objectionable and to be avoided whenever possible

Veterinary officers accomplish far more by prevention than by therapy but the opportunity to practice preventive medicine is dependent upon the ability to practice curative medicine successfully, and opportunities for the latter must not be neglected or the chance at the former will be lost. Public opinion exists in the army about as it does in civil life and is about as determinative. The reputations of veterinarians, in or out of the army, depend more on the few ailing animals that they cure than upon the many that they prevent from becoming ill. The Medical Corps gives every ailing soldier his chance, regardless of the prognosis, and while the Veterinary Corps cannot justify the waste of government funds on hopeless cases, neither can it afford the reputation of being quick on the trigger.

In general the treatment of contusions and abscesses of the back and withers comprised an immediate operation carried out under the best aseptic technique we were able to contrive, protection of the wound from contamination for 48 hours and then exposing it to the air and particularly to sunshine. The operative wound was packed with sulfanilamide at the time of the operation and thereafter dusted with it until the discharge had practically ceased. In most cases this required about a week, but the discharge was never profuse. At the time of the operation, or sooner if the opportunity offered, the animal was given therapeutic doses of sulfanilamide which was continued for a week.

The value of meticulous aseptic precautions in operations performed in the open might be questioned and even more the importance of such measures when the operation included evacuating enormous abscesses filled with pus. Experience seemed to demonstrate that the best asepsis obtainable is worth while under such conditions. There was no dust blowing about where the operations were performed. The surgeons wore rubber gloves and clean white suits and changed them frequently enough to keep them clean, often this meant several times daily. Large areas about the site of operation were shaved and cleaned as thoroughly as possible and in addition clean towels were used right up to the edge of the wound. The best anesthesia obtainable was employed. In most instances it could be described as perfect, or at least as satisfactory. The operations were performed rapidly and there was a minimum exposure of invaded tissues to the air, which is important. Exposure of operative wounds after a couple of days not only did no harm but appeared to hasten the healing process. Exposure of freshly incised tissues, even for an hour, appeared to be harmful and to delay healing, probably through coagulation of lymph and dehydration of tissue, or the opposite, the absorption of liquids by the cells that thus become edematous. Probably both conditions occur in different parts of the same wound and delay repair. And finally a good deal of credit must be



CONTUSED WOUNDS OF THE WITHERS

No two cases are alike. The one shown at the top may not be particularly serious although there is much swelling. When the serum is evacuated and the swelling subsides it may be found that the skin injuries are superficial and that none of the tissues underneath are so badly injured as to require removal. The case shown below may be quite severe; the injury being in the nature of a sitfast extending possibly as much as two inches into the underlying tissues. The emaciated condition of the animal, the engorged superficial veins and the desiccated appearance of the abraded surface warn the surgeon against any rosy prognosis

given to the local and general action of sulfanilamide in keeping down suppuration —thus promoting healing, and most important of all, keeping at a minimum the formation of scar tissue. Nothing is gained in the healing of an injury to the back of a cavalry horse if the contour of the back is not normal after the injury is healed, or if any large plugs of scar tissue remain. Such backs just won't stand the abuse that a saddle gives them in the army.

For the observance of asepsis in treating infected wounds it can be said that the pus from unopened abscesses is not always the mass of infection it appears to be. It may contain very few organisms, and in any case very few species of organisms. Further, the surrounding tissues may be presumed to have acquired considerable resistance to such organisms as are present in the wound. It seems highly important not to add a mass of new infection with which the tissues will have to contend. If, in spite of one's best efforts, a small amount of new infection is added to the wound the noxious insult to the tissues is not as great as from gross contamination, and the packing with sulfanilamide and the internal administration of the drug constitute a sort of redeeming apology.

Of the 366 cases of injured backs treated, some were returned to their organizations before recovery. These belonged to those organizations leaving the maneuver area for various stations other than Fort Bliss. An effort was made to follow up the more severe cases, and so far as was learned only two of those animals were destroyed because their further usefulness seemed unlikely, two required a second operation and 24 were returned to duty after an average of 55 days on sick report at their home stations.

Of the 17 cases of injured back that remained with the 30th Veterinary General Hospital at the end of the year, (three months after maneuvers) eight required a second operation. All gave promise of making complete recoveries ultimately. The treatment of those in the hospital after four months possibly was not justified by the outcome but, at the time treatment was commenced, they could not be picked out from among the larger number of similar cases that recovered in 60 to 90 days. Only 37 of the 366 cases required treatment for more than 100 days.

It can be said definitely that animals in fair condition recovered more promptly than those injured near the end of the maneuvers when they were debilitated and reduced to "skin and bones." However this may not have been due entirely to lack of recuperative power as animals in poor flesh are always more easily and perhaps more severely injured by saddle pressure than those in normal condition.

It was observed that these injured backs improved faster at the DeQuincy and Merryville locations than they did at the Calcasieu camp. At the two former locations the wounds were exposed to sunshine a few hours daily; the animals being kept in light shade where there were many areas of sunshine but at the Calcasieu camp no sunshine whatever penetrated the dense shade. Further, the weather was mostly dry at the sunny camps and it rained every day and most of the nights while the hospital was located on the Calcasieu River. The animals were noticeably better contented when in the sunshine part of the time and more restless and bellicose when in the deep shade all of the time. This did not apply to cases of exhaustion. They did badly in the sunshine; much better in the shade.

Extracting pieces of shrapnel, World War I
British Army Veterinary Service

The Relationship of St. Louis Encephalitis Virus to the Equine Encephalitis Problem

(With notes on results of Inoculation of Horses with St. Louis Encephalitis Virus)

By M. S. SHAHAN, L. O. MOTT, R. L. KNUDSON, O. L. OSTEEN, and L. T. GILTNER

Pathological Division, Bureau of Animal Industry
Washington, D. C.

IN the United States there are numerous causes for encephalitis in horses. The most common cause has been considered to be one or the other of the two known immunologically distinct types of equine encephalomyelitis (E.M.) virus. From time to time other factors enter into the picture, for example, toxins, especially those present in some samples of moldy corn. Still other miscellaneous etiologic agents require consideration in other cases. St. Louis encephalitis virus, first identified in 1933 through study of an epidemic in and around St. Louis, Missouri, now requires consideration as another possible cause of equine encephalitis.

The results of the first reported attempts to infect horses and mules by intracerebral inoculation of St. Louis encephalitis (S.L.) virus were inconclusive (1), but in the light of recent developments these assume more significance. More recently, Howitt, and Cox, Philip and associates have shown the presence of neutralizing substances for S.L. virus, as well as western E.M. virus in the sera of people and horses in concurrently epizootic and epidemic areas in California[2, 3] and Colorado,[4] and the susceptibility of the horse to S.L. virus has been proved.[5] St. Louis encephalitis has been further emphasized by the demonstration of neutralizing substances for the virus, and that of E.M. also, in sera of numerous other species of animals.[6, 7, 8] Finally, both E.M. and S.L. viruses have been reported in naturally infected mosquitoes (*Culex tarsalis*) collected in an epidemic and epizootic area in Washington.[9] These developments as a whole suggest that the viruses of E.M. (western) and S.L., together or separately, at different times or concurrently are involved in both epidemic encephalitis and epizootic encephalitis of horses.

Inoculations of Horses

In a test called A, 13 horses were inoculated intracerebrally with S.L. virus* by the writers. Seven of the animals inoculated were E.M. immune as proved by previous intracerebral inoculation of E.M. virus (western) following vaccination, four had been vaccinated with E.M. vaccine (east-

1. U. S. Public Health Service, 1935. Report on the St. Louis outbreak of encephalitis. *Pub. Health Bul.* No. 214.
2. Howitt, B. F., 1938. Antiviral substances to the virus of encephalitis (St. Louis type) in serums collected in California. *Proc. Soc. Exp. Biol. & Med.*, 38, p. 334.
3. Howitt, B. F., 1939. Viruses of equine and of St. Louis encephalitis in relationship to human infections in California. *Amer. Jnl. Pub. Health*, 29, p. 1083.
4. Philip, C. B., Herald R. Cox, and John H. Fountain, 1941. Protective antibodies against St. Louis encephalitis virus in the serum of horses and man. *Pub. Health Rep'ts.*, 56, p. 1388.
5. Cox, Herald R., Cornelius B. Philip and J. W. Kilpatrick, 1941. Susceptibility of horses to St. Louis encephalitis virus. *Pub. Health Rep'ts.*, 56, p. 1391.
6. Hammon, W. McD., J. A. Gray, F. C. Evans, E. M. Izumi, and H. W. Lundy, 1941. Western equine and St. Louis encephalitis antibodies in the sera of mammals and birds from an epidemic area. *Sci.*, 94, p. 305.
7. Cox, H. R. Communication to U. S. Bureau of Animal Industry.
8. Howitt, Beatrice F., and Wm. Van Herick, 1941. Neutralizing antibodies against St. Louis and western equine encephalitis viruses in horses and fowl. *Proc. Soc. Exp. Biol. & Med.*, 48, p. 247.
9. Hammon, W. McD., W. C. Reeves, B. Brookman, E. M. Izumi, and C. M. Gjullin, 1941. Isolation of the viruses of western equine and St. Louis encephalitis from *Culex tarsalis* mosquitoes. *Sci.*, 94, p. 328.

*Virus identified D 220 obtained through the courtesy of Dr. Charles Armstrong, National Institute of Health.

ern), but not exposed to the virus, and two were non-vaccinated and unexposed to E.M. as far as was known. Approximately 33,000 mouse m.l.d.'s of S.L. mouse brain in saline were injected in a dose of 0.5cc for each animal. All 13 horses developed symptoms, 11 recovered, one died, and one was killed *in extremis*.

All 13 horses, except one which developed what appeared to be a transitory shock from the injection, remained normal following inoculation for six to eight days (seven days in eight animals, eight days in three, and six days in two). At this time all developed fever ranging from 101.0° to 103.2°F. (observations made three times daily). The febrile reaction lasted for one to eight days, ending in one day in one case, four days in three instances, five days in two animals, six days in six, and in one case on the 8th day. The maximum temperature recorded in three daily observations of all animals was 104.6°F. (average of all cases—103.9°F.) The highest temperature reading was made on the 3rd day of illness in six cases, on the 2nd day in five cases, and on the first day in two cases.

The other symptoms as at first observed resembled those of E.M., but upon repeated close observations apparently distinct points of difference were noted. The most common and persistent abnormality observed was a general stiffness, which became so marked in some cases as to suggest laminitis, or even tetanus. In these cases there were delayed response to tugs at the halter (fig. 1) and general reluctance to move. When walking, the legs were incompletely extended and there was a tendency to "knuckle over" (fig. 2). At rest, a nervous shifting of weight from one leg to the other was frequently observed. The pupils of the eyes were neither contracted nor dilated and reacted normally to light. The conjunctivae in all cases were more or less congested and "muddy." Bowel evacuations and urination were apparently normal. Incoordination in gait was not observed, except as a consequence of the stiffness of the animals. There was some stupor in some cases, but extreme depression and somnolence occurred only in two cases. One of these animals died, and the other was killed when

Fig. 1. A horse inoculated intracerebrally with St. Louis encephalitis virus showing intractability and awkwardness

prostrate. Tremors and twitching of the lips, nostrils, and ears were uncommon, occurring in only a few instances. In all but four cases, the horses continued to eat and drink throughout the illness, though with somewhat less alacrity than normal animals. The anorexia and reluctance or inability to drink that occurred in these four instances were apparently due to stiffness and difficulty in getting the head down to the manger or bucket, rather than to paralysis or cerebral disturbance.

Symptoms continued after the fever receded, but there were gradual improvement and return to normal after seven to nine total days of illness, except in two animals (both eastern E.M. vaccinated), which went down and were unable to stand even with assistance. One of these died after six days of illness on the 12th day after inoculation, and the other *in extremis* was killed on the same day. By the 17th day after inoculation the 11 animals remaining were normal, so far as could be determined.

Recurrence of Symptoms

On the 21st day after exposure, four of the surviving 11 horses (three western E.M. immunes and one eastern E.M. vaccinated) developed symptoms like those from which they had just recovered. Two cases were afebrile, the other two developed mild fever, 101.2° and 102.4°F. In one of the latter the symptoms became acute with marked stiffness and nervousness, and a general ap-

pearance somewhat suggestive of strychnine poisoning. On the following day (the second day of illness) this animal went down and was killed by exsanguination. The remaining three animals affected by the second attack improved gradually and were normal one month after inoculation.

Reinoculation Tests

One control horse and eight of the ten animals in test A that survived inoculation of S.L. virus, including three that had recovered from the recurrence of symptoms after the first attack, were reinoculated intracerebrally 76 days after inoculation in test A with the same strain of S.L. virus originally injected (about 13,000 mouse m.l.d.'s were injected into each of the 9 animals). This will be referred to as test B. Following this inoculation only the control animal developed symptoms. In this case the incubation period was seven days and the symptoms persisted, without fever, for nine days. This animal (1344) then recovered completely. Horse 1344, together with two E.M. eastern vaccinated and one western E.M. immune, which had resisted re-exposure to S.L. virus 49 days before, as described in the foregoing, were exposed, with one control horse, to E.M. virus (western) injected intracerebrally. These inoculations with E.M. virus are referred to as test C. Only the one E.M. immune horse survived without symptoms, all others developing typical E.M., as confirmed by symptomatology, demonstration of pathology* in the brain, and recovery of the virus through inoculation of guinea pigs and mice. The virus recovered from each of these cases killed S.L. immune and normal mice when inoculated intracerebrally, while E.M. immune mice remained normal. No virus was demonstrable by inoculation of mice with suspension of spleen from each of the four horses.

Searches for Virus in the Blood

Beginning on the day after injection of S.L. virus into 13 horses in test A blood samples (defibrinated in tubes, with or without beads) were collected daily from each animal, for a period of 10 days. Additional samples were procured during illness in individual animals. The control horse in test B was bled three times daily; (just one time on the day of inoculation). This was continued for 10 days and intermittently thereafter during his illness. These blood samples, totalling over 200 in number, were injected intracerebrally in 0.03cc amounts into white mice, three to five with each sample. An effort was made to inject these samples as soon as possible after collection. In most cases they were injected within two to five hours after they were drawn, being kept chilled until used, but in some cases they were not injected until after one to three days storage in the refrigerator. Except for some few abnormalities and deaths, most of which only remotely suggested S.L. infection, the inoculated mice survived through the 14-day observation period. The brains of mice injected with 27 samples where possibilities of S.L. virus infection were considered were removed and injected into other mice. In a few cases a second sub-inoculation was made. In no instance was S.L. virus thus recovered from the blood of any of the inoculated horses.

Postmortem Examinations

The three horses (1335, 1336, 1262) in test A, which died or were killed when prostrate, and another in test A (1332) which was killed though normal 31 days after complete recovery from the primary attack, were examined postmortem. Horse 1332, the recovered animal, appeared normal, except for an apparent increase in cerebrospinal fluid. The animal (1335) dying of the disease was considerably decomposed when examined and identification of distinct abnormalities was impossible. Horse 1336, killed during the climax of the primary illness, was essentially normal, except for apparent increase in the cerebrospinal fluid and congestion of the brain. The body of the horse (1262) killed during the period of recurring symptoms results from inoculation with S.L. virus was similar, except for marked icterus and general congestion and hemorrhagic inflammation of the gastrointestinal tract, kidneys, and bladder. Considerable bruising of the tissues and small

*All pathological examinations referred to in this paper were made by G. T. Creech and H. R. Seibold, Pathological Division, B.A.I.

hemorrhagic tumors in the spleen were observed. The liver presented a yellowish-brown discoloration and well-marked definition of the lobules. Specimens of cerebrospinal fluid from this and the recovered

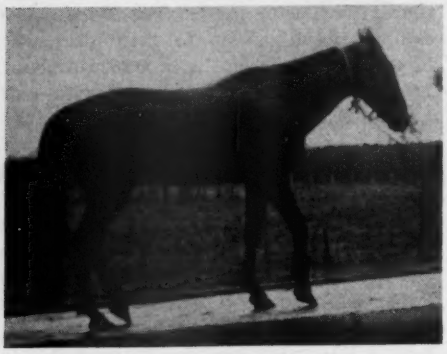


Fig. 2. A horse inoculated intracerebrally with St. Louis encephalitis virus showing partial flexion of legs and tendency to "knuckle over"

animal were found to be culturally sterile and free from virus, as shown by mouse inoculation. Through the courtesy of Col. Raymond Randall, U. S. Army Medical Center, examination of the cerebrospinal fluid from the recovered horse (1332) and the one (1262) suffering from a relapse was made. The results reported are as follows:

	Horse 1332	*Horse 1262*
White cell count	100 per c.m.m.	160 per c.m.m.
Differential (on basis of 20 cells counted)	72% lymphocytes 23% endothelials 5% polymorphonuclears	80% lymphocytes 10% mononuclears 10% polymorphonuclears
Globulin	slightly positive (erythrocytes in sample)	slightly positive to Nonne-Apelt test; negative to Ross-Jones

The brains were removed aseptically from these four horses and prepared for histopathological examination* and mouse inoculation. Although two and three attempts were made with each brain, using about 10 percent suspensions of brain stem and cervical cord in beef infusion broth, S.L. virus was recovered from only one of the animals, 1336, which had been killed when prostrate. From 10 to 20 mice were injected intracerebrally in each attempt. Only two of the 20 mice originally injected with suspension of brain 1336 developed S.L. Upon serial transfer, however, the virus regained regular virulence and titer in mice. Its identity was confirmed by the inoculation of S.L. immune mice and normal controls, the latter only developing the disease.

*The observations made in these cases by G. T. Creech and H. R. Seibold of the Pathological Division are summarized on this and the following page.

Horses 1335 and 1336

Histopathological examination revealed circulatory disturbances, cellular infiltrations and degenerative changes which involved both the neurons and the ground substance. The circulatory disturbances included vascular engorgement, perivascular hemorrhages, and blood extravasations in the brain substance, as well as some perivascular edema. The cellular infiltrations consisted of well-marked cuffing, considerable accumulations in the piarachnoid and diffuse and focal infiltrations of the brain substance. The infiltrating cellular elements were chiefly lymphocytes and monocytes. Only limited numbers of granulocytes were seen. The degenerative changes consisted of necrosis of many of the neurons in the cortex with some neuronophagia, and also necrosis of Purkinje cells of cerebellum with spongy degeneration of the ground substance at the borders of the granular layer. The latter change was more marked in horse 1336. The lesions on the whole appeared to be somewhat more extensive in the brain stem in both cases. Some congestion, cloudy swelling, clumping of the cytoplasm, and vacuolation of the cells were observed in the liver. The hepatic changes were somewhat more extensive in horse 1336. There was some congestion of the kidney with cloudiness and vacuolar degeneration of the tubular epithelium in the periphery of the cortex. The spleen was congested. The sinusoids were distended and there were definite hemorrhages in some areas.

Horse 1262

The Circulatory disturbances were slight and included some capillary congestion and a few perivascular hemorrhages. The cellular infiltrates consisted of perivascular accumulations ranging from single layers of cells to well-marked cuffing, considerable cellular infiltration of the meninges, and slight diffuse infiltration of the brain substance. The cells were largely lymphoid with some monocytes and a few large pigment-containing macrophages. Granulocytes were little in evidence. The cord showed some cellular infiltration and slight vascular cuffing. Gliosis and scattered glial foci were seen. In various portions of the meninges there appeared to be a definite thickening of the piarachnoid, indicative of a tendency to chronic changes. The degenerative changes were not well marked. There was slight vacuolation of the ground substance in some areas of the cortex, while in the cerebellum there was evidence of degeneration of Purkinje cells, and the ground substance at

the borders of the molecular layers was spongy and disorganized in appearance.

The liver showed lesions indicative of chronic passive congestion evidenced by capillary engorgement and atrophy of the liver cells in the central area of the lobules. The liver cells on the whole, particularly at the periphery of the lobules, were swollen and hydropic and in some lobules showed extensive vacuolar degeneration.

The kidneys were congested, more particularly the glomeruli, and there were hemorrhages, many of the tubules being filled with blood. Much of the tubular epithelium appeared more or less swollen and cloudy. Definite degeneration was seen in some tubules, being more in evidence in the peripheral areas of the cortex. Many of the tubules were filled with albuminous material, and hyaline droplets were seen in the epithelium of a few of the tubules. The spleen was congested, and there was some reticulosis of this organ. In some of the splenic arteries there were thickening and calcareous granules of the intima. A fibrinous and hemorrhagic exudate was observed on the peritoneal covering of this organ. The spleen contained an excessive amount of pigment.

The wall of the cecum was greatly thickened due to congestion, hemorrhage, edema, and infiltration of lymphocytes, plasma cells, monocytes, and large numbers of eosinophiles. There were considerable necrosis and sloughing of the superficial mucosa in some areas. In the intestinal wall the arterial walls showed thickening of the intima and calcareous granules similar to changes noted in the spleen.

It would seem probable that the organic changes were due in part at least to circulatory disturbance, particularly in view of the evidence of vascular irritation noted in the spleen and cecum. The cause of the lesions in the cecum was not evident.

Recovered Case—Horse 1332

The circulatory disturbances were slight and included scattered perivascular hemorrhages (possibly mechanical) and some perivascular edema. There were perivascular infiltrations in the cerebrum, cerebellum, and brain stem along with some cellular infiltration of the meninges and limited diffuse cellular infiltration of the brain substance. The perivascular infiltrations were largely of lymphoid cells and varied from single layers of cells to rather heavy cuffing of some vessels. Few granulocytes were present. There was very slight cellular infiltration of the cord, and cuffing of a few vessels was noted. In addition to the infiltrations, there were considerable gliosis and an unusual amount of satellitosis, and scattered foci of glial cells were noted in some sections. There was also some thickening of the piarachnoid. The degenerative changes on the whole were less pronounced than in the acute cases and were more in evidence in the cerebellum in which there were degeneration of the Pukinje cells and well-marked spongy vacuolation of the ground substance in some areas at the borders of the molecular layer. Degenerative changes were also noted in occasional areas in the pons and medulla.

The spleen was slightly congested and there appeared to be some vascular thickening, particularly of the capillaries. There was some similarity in the lesions of the brain in this case and those observed in horse 1262.

Neutralization Tests

Blood serum samples were obtained from the 13 horses in the above described test A at various intervals before and after the inoculations of S.L. virus. The number of tests for neutralization of S.L. virus conducted by the writers* have of necessity been somewhat limited. Serum from one of the horses (exact origin unknown neutralized 100 mouse m.l.d. of S.L. virus before the animal was exposed; the other 12 failed at this time to neutralize. Tests of sera collected from five western E.M. immune horses and three eastern E.M. vaccinated horses 60 days after primary exposure to S.L. virus (test A) and again two weeks after second exposure to S.L. virus (test B) gave the following results: Four of the five E.M. immune horses failed to neutralize even minimal amounts of S.L. virus at 60 days after first exposure to S.L. virus, whereas one E.M. immune and three eastern E.M. vaccinated horses, including the one whose serum neutralized virus before exposure in test A, neutralized 10-100 mouse m.l.d. Sera collected two weeks after second exposure to S.L. virus from the five E.M. immunes, the three eastern E.M. vaccinated animals and the control (1344) in test B all neutralized from 10 to 100 mouse m.l.d. The second injection of S.L. virus in the interval between the time of collection of sera failing to neutralize S.L. virus and the collection of sera giving positive results appears to be the only reasonable explanation for the change, although, as has been pointed out by Web-

* Freshly harvested S. L. mouse brains, finely triturated and diluted serially in tenfold steps in chilled physiological salt solution, were mixed with an equal volume of the undiluted serum to be tested. Positive and negative control horse sera for the tests were provided by Dr. H. R. Cox, Public Health Service, both being included in each test. After the serum-virus mixture had been incubated at 37° C. for 2 hours it was immediately inoculated into mice in groups of 4 to 6 for each virus dilution. The mice were observed through a 14-day observation period.

ster and Fite,[10] Hammon and Howitt,[11] and others, antibody response to S.L. virus is relatively slow. The reported loss of neutralizing power for S.L. virus in serum stored in the refrigerator may also be an important consideration in such tests.[12]

Discussion

All of 14 horses injected intracerebrally with S.L. virus developed an illness differing from E.M. as seen by the writers in several hundred natural and experimental cases. These are summarized as follows with respect to intracerebral inoculation of the two viruses:

	St. Louis encephalitis	Equine encephalomyelitis (western)
Incubation period	6-8 days	3-5 days
Course	7-9 days	2-5 days
Fever	Absent or mild, to 104.6°	Absent to as high as 107°, tending to be diphasic
Dehydration	Slight	Marked
Appetite	Most cases continued feeding except for 1 or 2 days	Anorexia in most cases
Disturbance of gait	Incomplete extension of legs, stiffness	General incoordination
Nervous symptoms	Mild and variable	Hyperesthesia, paralysis, stupor, somnolence
Defecation and urination	Normal	Retarded
Mortality	Less than 25%	Approximately 100%

E.M. immune horses were found to be susceptible to intracerebral inoculation of S.L. virus, as was expected from the results of laboratory tests by Cox and Fite,[13] Casals and Palacios,[14] and others.

Eight horses surviving inoculation with S.L. virus resisted reexposure 59 days after recovery from the primary exposure.

S.L. resistant horses were found to be susceptible to inoculations with E.M. virus (western).

Failure to find virus in the blood of horses inoculated intracerebrally with S.L. virus is in conformity with the results of Cox and associates,[5] though these investigators did find virus in the nasal secretion. On the other hand, Hammon, Carle, and Izumi[15] have demonstrated S.L. virus in the blood of horses experimentally inoculated with a strain of virus recently recovered from mosquitoes in the State of Washington.[9] These investigators exposed two yearling fillies, one intranasally and one subcutaneously, and two 2-year-old stallions, one subcutaneously and the other intracerebrally. Fever or other symptoms did not develop in any of the four animals, although all were judged from previous negative neutralization tests to be susceptible. As stated by Hammon and associates, their animals probably developed inapparent rather than apparent, or frank infection, because of the lack of previous artificial adaptation of their virus to nervous tissue. The virus used was more recently derived from natural sources and probably more nearly represented what, from the evidence at hand, may be supposed to be transmitted by mosquitoes. The application of conditions more nearly resembling those which may exist in nature might well modify the results to be obtained from mosquito transmission experiments with S.L. The results thus far reported[16, 17] have been essentially negative. The results obtained by Hammon, Carle, and Izumi with S.L. virus[15] recall a case of inapparent infection in a horse, with virus in the blood, induced by bites of *Aedes aegypti* mosquitoes infected with western E.M. virus.[18] More than a year later this animal was found to be immune to western E.M. virus injected intracerebrally.

10. Webster, L. T., and G. L. Fite, 1933. A virus encountered in the study of material from cases of encephalitis in the St. Louis and Kansas City epidemics of 1933. *Sci.*, 78, p. 463.
11. Hammon, W. McD., and B. F. Howitt, 1942. Epidemiological aspects of encephalitis in the Yakima Valley, Washington: mixed St. Louis and western equine types. *Amer. Jnl. Hyg.*, 35, p. 163.
12. Meiklejohn, G., and W. McD. Hammon, 1942. Epidemic of encephalitis predominately St. Louis type, in Pinol County, Arizona. *Jnl. A. M. A.*, 118, p. 961.
13. Cox, H. R., and G. L. Fite, 1934. Serological distinctions between the viruses of encephalitis in St. Louis 1933, equine encephalomyelitis and vesicular stomatitis. *Proc. Soc. Exp. Biol & Med.*, 31, p. 499.
14. Casals, J., and R. Palacios, 1941. The complement-fixation test in the diagnosis of virus infections of the central nervous system. *Jnl. Exp. Med.*, 74, p. 409.
15. Hammon, W. McD., B. N. Carle, and E. M. Izumi, 1942. Infection of horses with St. Louis encephalitis virus, experimental and natural. *Proc. Soc. Exp. Biol. & Med.*, 49, pp. 335-340.
16. Webster, L. T., A. D. Clow, and J. H. Bauer, 1935. Experimental studies on encephalitis. III. Survival of encephalitis virus (St. Louis type) in *Anopheles quadrimaculatus*. *Jnl. Exp. Med.*, 61, p. 479.
17. Fulton, J. D., J. E. Greutter, E. B. Meuther, E. B. Hanss and G. O. Broun, 1940. Observations concerning *Culex pipiens* as a possible carrier of St. Louis encephalitis. *Proc. Soc. Exp. Biol. & Med.*, 44, p. 255.

If, as is generally assumed, the presence of neutralizing substances is acceptable evidence of previous exposure to S.L. virus, horses and many other animals, as well as man, may be affected with the disease in an inapparent or not yet recognized apparent form. It remains, however, to demonstrate S.L. virus under natural conditions in any species other than man and mosquitoes. In the writers' opinion, this is a primary requisite before the role of animals in the perpetuation and spread of the disease can be definitely determined. During 1941, the Bureau in its examination of specimens from field cases of encephalitis in horses and mules, included mice with the usual guinea pigs as laboratory test animals in searching for virus. Both species are susceptible to E.M. virus, but only mice to S.L. virus, according to our experiences with one strain of virus and those of most others with other strains. If this work is continued, S.L. virus should be demonstrated eventually if the species examined are actually implicated. It has been suggested that mixed infections with both S.L. and E.M. viruses may exist.[12] Absolute proof of this depends upon demonstration of both viruses in the same animals.

The S.L. neutralization tests, conducted by the writers in connection with the horse inoculations here reported are too limited to warrant definite conclusions, but there is suggestive evidence in them. For example, a horse carrying S.L. neutralizing bodies in its blood developed S.L. after intracerebral exposure as readily as 12 other horses without demonstrable neutralizing substances. Upon reexposure, eight of these animals, four without demonstrable neutralizing substances and four with these antibodies, were all immune. As has been suggested in the case of E.M.,[18] there may be no constant relationship between S.L. antiviral substances in the blood and tissue immunity. Or is there a possibility that neutralizing substances may not be specific, at least in all cases? The need for a standard technique for neutralization tests has been expressed by Hammon and Izumi.[19] The writers are in agreement with this view and go further to suggest that the entire subject of virus neutralization deserves reevaluation through intensive research under controlled conditions.

18. Giltner, L. T., and M. S. Shahan, 1936. The present status of infectious equine encephalomyelitis in the United States. *Jnl. A. V. M. A.*, 88, N.S., 41, p. 368.

Summary*

Fourteen horses, seven immune to western type encephalomyelitis, five vaccinated against eastern E.M. but unexposed, and two nonvaccinated and nonexposed to E.M., developed disease when inoculated intracerebrally with St. Louis encephalitis virus. Two animals were severely affected; one died and the other was killed *in extremis*. Four of the 12 horses that recovered from the primary attack of disease developed relapses for which no other cause was apparent than the St. Louis encephalitis virus originally injected.

Eight horses that recovered from inoculation with St. Louis encephalitis virus were found to be immune on reinoculation.

Three horses, which recovered from St. Louis encephalitis virus, were susceptible to intracerebral inoculation of western equine encephalomyelitis virus.

Following intracerebral inoculation of 14 horses, St. Louis encephalitis virus did not appear in the blood in amounts demonstrable by mouse inoculation.

Differences in the symptoms observed in horses inoculated with St. Louis encephalitis and western equine encephalomyelitis viruses are pointed out.

Results of a limited number of in-vitro neutralization tests of blood serum collected from horses injected with St. Louis encephalitis virus are given.

Various considerations of the equine encephalitis problem with reference to both veterinary and public health aspects of St. Louis encephalitis are offered.

19. Hammon, W. McD., and E. M. Izumi, 1942. A virus neutralization test, subject to standardization: used with western equine encephalomyelitis, St. Louis encephalitis and mouse-adapted poliomyelitis viruses. *Jnl. Immunol.*, 43, pp. 149-157.

* Since writing this manuscript an article by Beatrice F. Howitt of the Hooper Foundation (*Jnl. of Immunol.*, 1941, 42:117) has come to our attention. Briefly, Howitt reports recovery of equine encephalomyelitis and/or St. Louis encephalitis virus from the blood of monkeys injected intracerebrally or intracutaneously with one or both varieties of virus. Neutralizing substances for the equine virus were readily demonstrable in the sera of the experimental animals. Such substances for St. Louis encephalitis virus were less regularly found. In the case of mixed infections, with one exception, neutralizing substances for St. Louis encephalitis virus were not demonstrated. On the other hand, the equine virus was neutralized in all but one case.

Treatment of Lice in Army Horses

The following observations on the efficiency of the proprietary articles derrimac, derrisol and pulvex, and of paraffin emulsion for the destruction of lice (*Haematopinus asini*) were inaugurated in Palestine.

The tests were made by treating horses infested with lice or by placing lice on the surface of cottonwool and then submitting them to the action of the preparation being tested. The lice were then kept under constant observation with the aid of a magnifying glass, and the minimum period for a lethal effect upon the lice noted. The parasites were kept under observation even longer than this period to be sure they did not subsequently revive on exposure to air.

Louse infested horse. Showing how the parasites deplicate the neck

1. *Derrimac.*—This preparation, when applied to lice on cottonwool, was found to be lethal in one and one-half minutes.

2. *Derrisol.*—When applied as a 1 to 500 solution to lice on cottonwool, was lethal in 30 minutes. A horse infested with the lice was treated with a solution of 1 to 250 which was allowed to dry on the coat; all the lice were killed and no toxic symptoms were shown by the horse. On other horses treated with a solution of 1 to 500, live lice were found after treatment.

3. *Pulvex.*—This preparation was employed in three forms: (a) As a powder. This was lethal in 45 minutes on the surface of cottonwool, in three minutes below the surface. (b) As an aqueous solution (12%). This was lethal in three minutes. (c) As a paste (pulvex 1 part, soft soap 2 parts, whale oil 2 parts). When in close contact with the lice this preparation was lethal almost instantaneously.

4. *Paraffin Emulsion* (one ounce of tobacco per gallon).—This emulsion was lethal in ten minutes, provided it came in thorough contact with the lice.

Summary

Derrimac proved to be the most effective for the destruction of lice. It has the disadvantage, however, of causing toxic symptoms, especially in the presence of water. It would thus be contraindicated in a perspiring horse.

Derrisol was effective in destroying lice in a 1 to 250 solution. It is non-toxic and is easy to apply.

Pulvex was found to be safe and efficient.

Paraffin emulsion is efficient if rubbed well into the coat.—*Lieut. A. N. Bain, Jnl. Royal Army Veterinary Corps.*

Horse Pox Among British Army Animals

An outbreak of equine contagious pustular stomatitis occurred in England among a number of remounts. It commenced in and was chiefly confined to a squadron of fairly young chestnut horses which were accommodated either on open lines or in lean-to sheds with bale separation, and situated upon land which became muddy after heavy rains.

The general condition of the horses in this squadron was below that of the other three squadrons, which will be referred to later and which were housed in stables scattered throughout three villages several miles apart.

Another outbreak occurred in Palestine and arose without any apparent possibility of direct equine contact, but with a remote chance of indirect contact by traversing tracks used by native animals. In common with the outbreak in England the first case was found in a horse belonging to the squadron whose animals were in the poorest condition. All horses of the unit were improving in condition after having been subjected to severe hardship and were on open picket lines.—*Jnl. R.A.V.C.* Feb., 1942.

Abstracts

African Horsesickness

A description is given of the morbid anatomy of natural and experimental cases of the disease.[27] In contradiction to previous workers, no evidence was found of inclusions in the liver, kidney, or brain. There was a myloid degeneration of the muscle coat of the intestine and sometimes of the stomach. Proliferation of epitheloid cells was found in the mesenteric lymph nodes, and in the lymph nodes in general there were numerous cells of the granulocyte series, and erythroblasts.—*J. E. B.*

* * * *

Blood Groups and Blood Transfusion in Army Horses

The blood groups of 400 light horses in the German army[25] were determined and evidence of the existence of six agglutinogens and six corresponding agglutinins were found. Nearly half of all the blood samples contained two agglutinogens, AB being the commonest combination. The agglutinins were less abundantly found, 67% of all samples having none. Landsteiner's rule that blood not containing the agglutinogens A and B always contains the agglutinins a and b, was confirmed.

Experimental transfusions were carried out on 12 horses, the blood groups of donor and recipient being known beforehand in only two cases. Results were good as regards lack of shock in the recipients in ten cases, but bad in two cases. In the latter it was later determined that the recipient's blood contained agglutinin a and the donor's blood agglutinogen A. Symptoms of shock due to agglutination and lysis of transfused red blood corpuscles included a slight rise in temperature, marked increase in pulse and respiration rates, icterus, sweating, and greater or lesser excitement.

The determination of blood groups in horses require laboratory facilities and supplies of known types of red blood corpuscles and serum; in active army conditions, therefore, it is impossible to determine blood groups before transfusion. The most rapid practical test of compatibility is the small dose test, wherein the transfusion is begun with 100 to 200cc and continued or stopped as the recipient's behavior indicates.

The author states that it is desirable that a record should be made of the individual blood group of every army horse so that the choice of donor animal can be made quickly when transfusion is indicated.—*J. E.* in *Vet. Bul.*

* * * *

Artificial Feeding of Army Horses

Army horses require to be fed artificially when they are unable to feed normally, e.g., when affected with fractures, painful suppurative conditions about the jaws and mouth, or with local paralysis, tetanus, etc.[24]

Rectal feeding and intravenous feeding with sugars are unsatisfactory except for very short periods; therefore the following method was evolved. It has given excellent results.

A stomach tube of ordinary calibre is used and the food is minced and pumped through the tube by means of a sausage-filling machine. Roots, greens, corn, fruit, etc., can be fed. It is reduced to small fragments that pass easily through a stomach tube in the watery mass to which has been added —and this is the important point for success —a mucilaginous and swelling compound sold under the name of "Viskogela" (a gel which on melting gives a solution of high viscosity, ordinarily used as an obstetric lubricant. It contains 5%, active chlorine.) Horses are fed twice daily, each time with six quarts of the food mixture, which is given in ample portions with a pause between each. Horses so treated regained condition quickly after a few such meals and recovered their appetites. Army horses under similar conditions recovered much more slowly when not artificially fed. Linseed mucilage was found to be far inferior to "Viskogela" as a lubricant for the food.

[27] Marcato, A., 1939. Contributo Anatomoistopatologico alla conoscenza della peste equina. (Pathology of African Horsesickness in Eritrea.)—*Nuova Vet.* 17, pp. 45-53.

[25] Hallwachs, H., 1938. Blutgruppenuntersuchungen und Bluttransfusionen beim Pferde. *Inaug. Diss., Berlin,* p. 40.

[24] Balz, 1940. Artificial feeding of horses; *Tierarztl. Rdsch.* 46, pp. 489-91. Abst. *Vet. Rec.,* 53:29, p. 419.

Seaweed Fed to Army Horses

In feeding tests of seaweed meal to Eastland horses[26] during military service, 33 horses were used in the experiments; ten serving as controls. The experiments lasted two months. Results showed that some of the oats (20 percent) can be replaced by seaweed meal without causing perceptible injury or impairment of condition.

Upon examination of the excrement for presence of parasite eggs, it was found that the feces of horses fed on seaweed meal contained far fewer eggs of parasites than that of the controls.

* * * *

A Blasted Horse

Last autumn,[23] at 4 a.m., a heavy H. E. bomb demolished a building and 20 houses about 80 yards from a stable, which occupied the ground floor. Intervening houses prevented any damage being done to the building although there was terrific concussion. In the stable fourteen horses, probably asleep at the time, appeared all right but were frightened and restless. Two animals lay unconscious. One (aged 11) recovered in two hours, and after massage treatment was put to work within 48 hours, and suffered no permanent ill-effect. The other one lay as dead for over four hours. The pulse was so slow that the stable foreman was preparing to kill him when suddenly he shivered and got up but could not use his hindquarters to walk. Fomentations and massage were applied and a week later he was able to do light work about four days out of six. But there remained a slight lameness in the hindquarters.

"Three months after the first bomb there was a direct hit on the same stable which killed two horses instantly. The remaining 12 were able to walk and nearly all of them were at work that day. The unrecovered case of the former blast had a severe relapse. He could not back and found difficulty in turning. The symptoms indicated paralysis in the region of the spine. There was no recovery.

[26] Moholdt, A., 1940. The Feeding of Seaweed Meal to Army Horses. *Norsk Veter Tidsskt.* 52, p. 38.

[23] Buxton, H. F., 1941. The Blasted Horse—and Others. *Vet. Rec.* 53:31, p. 451.

Vitamin A Deficiency in Horses

The authors[22] survey briefly some of the work of recent years in connection with the results of vitamin A deficiency in horses. They note the hoof changes observed by Kleinolov in Finnish Army horses, the debility reported by Chatelain and Edwards, and the night blindness observed by Meadows in Persia. They point out that the idea of a single systemic disturbance being associated with the abnormalities of bones and joints of horses has been held by some people since 1904. They quote Mitchell's hypothesis connecting certain of the unsoundnesses of horses with a dietary origin and the work of Kelser and Callender on equine degenerative arthritis in U. S. Army horses in the Panama Canal Zone. They set themselves to produce data to show the effect of combined vitamin A deficiency and varying calcium and phosphorus ratios, with particular reference to joint lesions.

The animals they used were pure-bred Percherons of ages varying between 119 and 444 days at the start of the experiment, seven colts and four fillies. The rations on which they were fed contained barley, oats, wheat bran, linseed meal, beet pulp and cottonseed meal, having a carotene content of 0.01 to 0.02 mg per 100 grams. In some cases this was supplemented by barley straw with a content of 0.05 to 0.1 mg of carotene per 100 grams. The animals were divided into five groups and the rations arranged so that the Ca/P ratios were as follows: 1:5, 1:1, 1:7, 1:1, 2:1. The experiments extended over a period of about two and a half years.

One animal died from other causes and of the other 10 all showed night blindness after periods varying between 236 and 501 days on the deficient diets. There was irregular opaque streakings of the cornea, but no evidence of permanent blindness due to pinching off of optic nerves in the optic canals. Lacrymation was associated with this and all animals showed a capricious appetite, progressive weakness, and eventually death. In all cases there developed joint involvement with lameness and rarefying

[22] Howell, C. E., *et al* 1941, Vitamin A deficiency in horses. *Amer. Jnl. Vet. Res.* 2, p. 60. *Abst. Vet. Rec.* 54:3, p. 41.

lesions in the joint cartilages and in a number of cases there were incordination and symptoms resembling "shivering".

The authors point out that they have not obtained positive evidence that the joint condition was due primarily to vitamin A deficiency. The evidence does point that way but against this is the fact that avitaminosis A usually produces lesions in epithelial tissue whereas joint structures are of mesoblastic origin. Certain reproductive difficulties were observed and the growth curves of the animals were abnormally variable. The authors found that the varying of the calcium-phosphorus ration of the diets did not seem to play an important roll in the nutrition of the animals.

A Rare Case of Foreign Body in a Horse

The owner of a three-year-old Shire mare stated that the animal had always been in perfect health until the previous day, when it appeared rather uneasy.[21]

She was continually rolling, getting up and going down again, and in considerable pain. No feces had been passed for some time, and a tentative diagnosis of obstruction was made. During the day an aloetic bolus and two draughts of oil of turpentine and ether in linseed oil were given.

The next day the patient appeared rather easier, with no acute attacks of pain; ate a little steamed hay and bran. No feces had been passed as yet; the heart sounds were weak, the pulse was rapid, and the temperature was 100°F. An injection of strychnine was given. By the following day the mare was passing small quantities of feces rather soft in character. Respirations were shallow and rapid (80 per min.), pulse slightly stronger, temperature 103°F. The animal did not refuse feed until the next morning, at which time she was passing quantities of watery feces and becoming weaker. The temperature was 102°F.

A guarded prognosis was given the owner. It seemed that the medicaments might have caused superpurgations, so three draughts, each containing ½ ounce of chlorodyne, were left to be administered during the course of the day.

However, the mare gradually became weaker and died during the next forenoon, having been sick six days.

Post-mortem examination revealed localized peritonitis, caused by puncture of the duodenum by a straight piece of steel-wire, five inches long and thick as a fine knitting needle, which was considerably corroded although it could not be determined how much time had elapsed between ingestion and the onset of symptoms, except that the area of necrosis of the bowel wall was about 2½ inches long and extended about halfway around it.

The rarity of foreign bodies in the horse and the seeming impossibility that such an object could negotiate the esophagus and the pylorus before being arrested in its travels, make the case one of unusual interest.

[21] Allen, G. S., 1941. A rare case of foreign body in the horse. *Vet. Rec.* 53:50, p. 733.

Mustard Gas and Army Animals

Because of its relative chemical stability and its power of solubility and penetration, protection against mustard gas is very difficult.[30] The action on tissue is that of a cell poison resulting in necrosis. A distinction is drawn between the effects caused by the liquid gas and the vapor; the action of the latter when encountered in field concentrations is weak except upon the eyes. Drops of the liquid gas falling on the skin cause the appearance of tufts of erect hairs, followed by edema, superficial necrosis, and the gradual sequestration of the dead portion of the skin. Decontamination (first aid treatment) aims at neutralizing and removing the poison before it is completely absorbed by the skin. The success of this early treatment depends upon the speed with which it is employed after contamination, and many practical difficulties must be expected. The mule is more sensitive than the horse to mustard gas, and also less tolerant to bleaching powder applied either as a watery paste or as an ointment. The camel is relatively tolerant.

[30] Bamford, R. M., 1940. Mustard gas and army animals. *Jnl. Roy. Army Vet. Cps.* 11, pp. 113-128. Abst. in *Vet. Bul.* 11:6, p. 405.

Hemathidrosis in Russian Horses

Cases of bloody perspiration are quite frequent in Russia and Hungary [29] where, during the summer, horses are exposed for long periods to direct rays of the run. In 20 cases examined, no specific cause was found, parasitic or otherwise; the blood picture was perfectly normal. It may be that the skin of horses that are ill is particularly sensitive to sun rays and that the excitation of nerve endings in the skin may cause rupture of small blood vessels.

Phenothiazine in the Treatment of Strongylosis

Phenothiazine in doses of 30gm (0.66gm per kg for a 1000-pound horse) was 100% efficient in the treatment of equine strongylosis.[12] It was found to be nontoxic in therapeutic doses; it is not a purgative, nor are accessory purgatives required for its effective action, as it is both a vermicide and a vermifuge. It is inexpensive, administration is simple, and it causes very little interference with the normal diet and work. It supersedes all other forms of treatment for strongylosis in horses and mules.

Sulfanilamide in the Treatment of Strangles

One large dose produced only a temporary improvement, and the temperature again rose after three or four days.[14] Repeated doses, however, at either daily or two-day intervals, produced favorable results. Of 34 cases so treated there was a good response in 17, while nine cases were doubtful and eight negative. The use of 80gm doses (given in water by stomach tube) at two-day intervals until the temperature falls, is recommended. Horses should have complete rest during the period of fever and for three days thereafter.

[29] Erler, 1938. *Zeitschr. Veterinaerk.* 1938, p. 414.—Abstr. in Bull. *Serv. Zootech. et Epizoo.* Afr. Occ. Fran., III, 1, 1940.

[12] Knowles, R. H., and W. P. Blound, 1941. Experimental observations on phenothiazine relative to the treatment of equine strongylosis. *Jnl. R. A. V. C.* 12:2, pp. 51-65. Abst. in *Exp. Sta. Rec.*

[14] Steck, W., 1940. The effect of large doses of sulphanilamide on the course of strangles in adult horses. *Schweiz. Arch. Tierheilk.* 82, pp. 325-332. Abst. in *Vet. Rec.*

Italian Veterinary Service

In the Italian operations in the Italo-Abyssinian war, provisions were made for the personnel and equipment of the veterinary corps, veterinary services in the field, horse shoeing, reports and statistics.[28]

Two hundred and forty-seven veterinarians were engaged in the war. They had about 100,000 transport animals which were used for practically all transport except that of troops. It has been stated that 500 horses, 7,000 mules, 2,000 donkeys and 900 camels were bought for transport purposes. The total losses in these animals were about 30%.

The organization of the veterinary corps changed somewhat during the war, but in general followed the usual system. Animal hospitals, convalescent camps and remount parks were organized. About 36,000 animals were treated for wounds or disease and 25,000 are said to have been returned to duty.

The veterinary corps supervised meat supplies for the Italian armies, including the supervision of parks for living food animals, and also of frozen meat which was imported in large quantities.

Shoes for horses were supplied from Italy and were satisfactory, but much trouble was experienced in providing shoes for mules and donkeys. The feeding of transport animals was difficult in that there were numerous cases of colic with some losses. There were also great losses in camels taken into the mountainous interior.

The most important infectious and parasitic diseases of animals during the war were African horse sickness, equine influenza, trypanosomiasis in horses, cattle and camels, piroplasmosis in horses and cattle, mange in horses and camels, and helminthiasis in horses and camels. There were also non-specific conditions such as heat stroke, saddle galls, loss from exhaustion and troubles from faulty acclimatization.

[28] Erban, 1939. Der italienische Veterinardienst in italienisch-abessinischen Krieg. Unter Mitbenutzung der Preisarbeiten 1937-38. Suppl. to Z. Veterinark. 51:10. Abst. by J. E. in the *Vet. Bul.* 10:11, pp.890-891.

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS